

**Final
2020 Baseline Monitoring Report
Red Devil Mine, Alaska**

May 2021

Prepared for:

**U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
Anchorage Field Office
4700 BLM Road
Anchorage, Alaska 99507**

Prepared by:

**ECOLOGY AND ENVIRONMENT, INC., MEMBER OF WSP
720 3rd Avenue
Seattle, Washington 98104-1816**

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List of Abbreviations and Acronyms

BLM	U.S. Department of the Interior Bureau of Land Management
cfs	cubic feet per second
COCs	Contaminants of concern
E & E	Ecology and Environment, Inc., member of WSP
IDW	investigation-derived waste
MPA	Main Processing Area
QC	quality control
RDM	Red Devil Mine
RI	Remedial Investigation
SMA	Surface mined area
TAL	target analyte list
TDS	total dissolved solids
TSS	total suspended solids
Work Plan	<i>Final Work Plan, Groundwater and Surface Water Baseline Monitoring, Red Devil Mine, Alaska</i>

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1

Introduction

This report presents the results of the spring and fall 2020 baseline groundwater and surface water monitoring effort at the Red Devil Mine (RDM) site (see Figures 1-1 and 1-2). The RDM is an abandoned mercury mine and ore processing facility located on public lands managed by the Bureau of Land Management (BLM) in southwest Alaska. Historical mining activities included underground and surface mining and ore processing. Onsite ore processing included crushing, retorting/furnacing, milling, and flotation. Ecology and Environment, Inc., member of WSP (hereafter referred to as E & E) prepared this baseline monitoring report on behalf of the BLM under Delivery Order Number 140L6318F0016 and General Services Administration Contract Number GS-10F-0160J.

This report summarizes the field activities, procedures, and results for baseline monitoring of groundwater and surface water performed at RDM during 2020.

1.1 Purpose and Objectives

The purpose of the baseline monitoring is to collect surface water and groundwater samples, as well as streamflow and groundwater elevation data to inform remedial actions at the RDM. This baseline monitoring expands upon work that began during the 2011–2014 Remedial Investigation (RI) and continued through the 2015–2018 RI Supplement and contemporaneous baseline monitoring for groundwater and surface water. The objectives of the baseline monitoring are to:

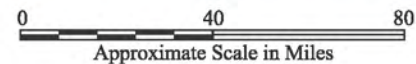
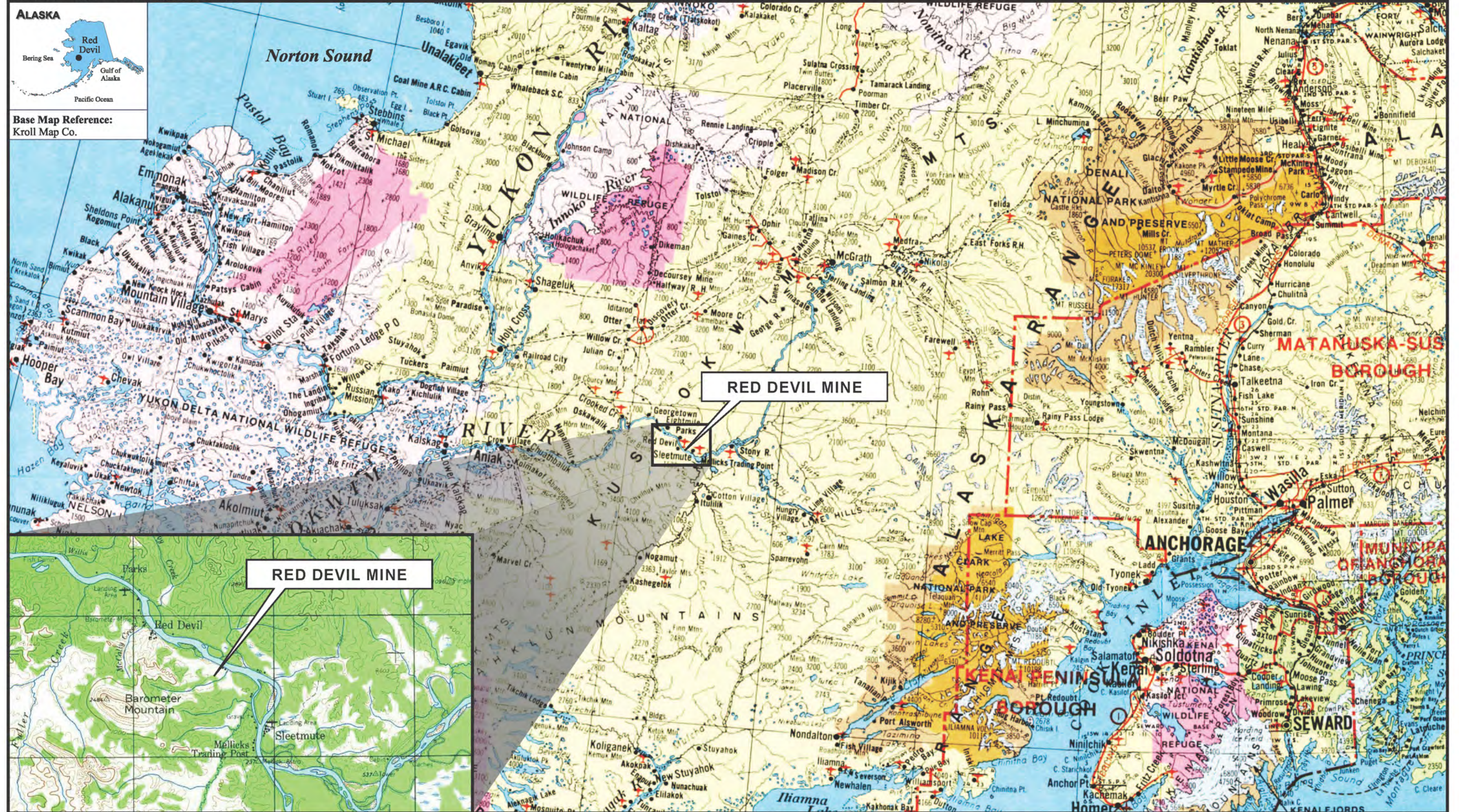
- Define baseline conditions prior to remedial action;
- Characterize the seasonal variability in groundwater and surface water hydrology and quality; and
- Characterize the long-term (multiple-year) variability in groundwater and surface water hydrology and quality.

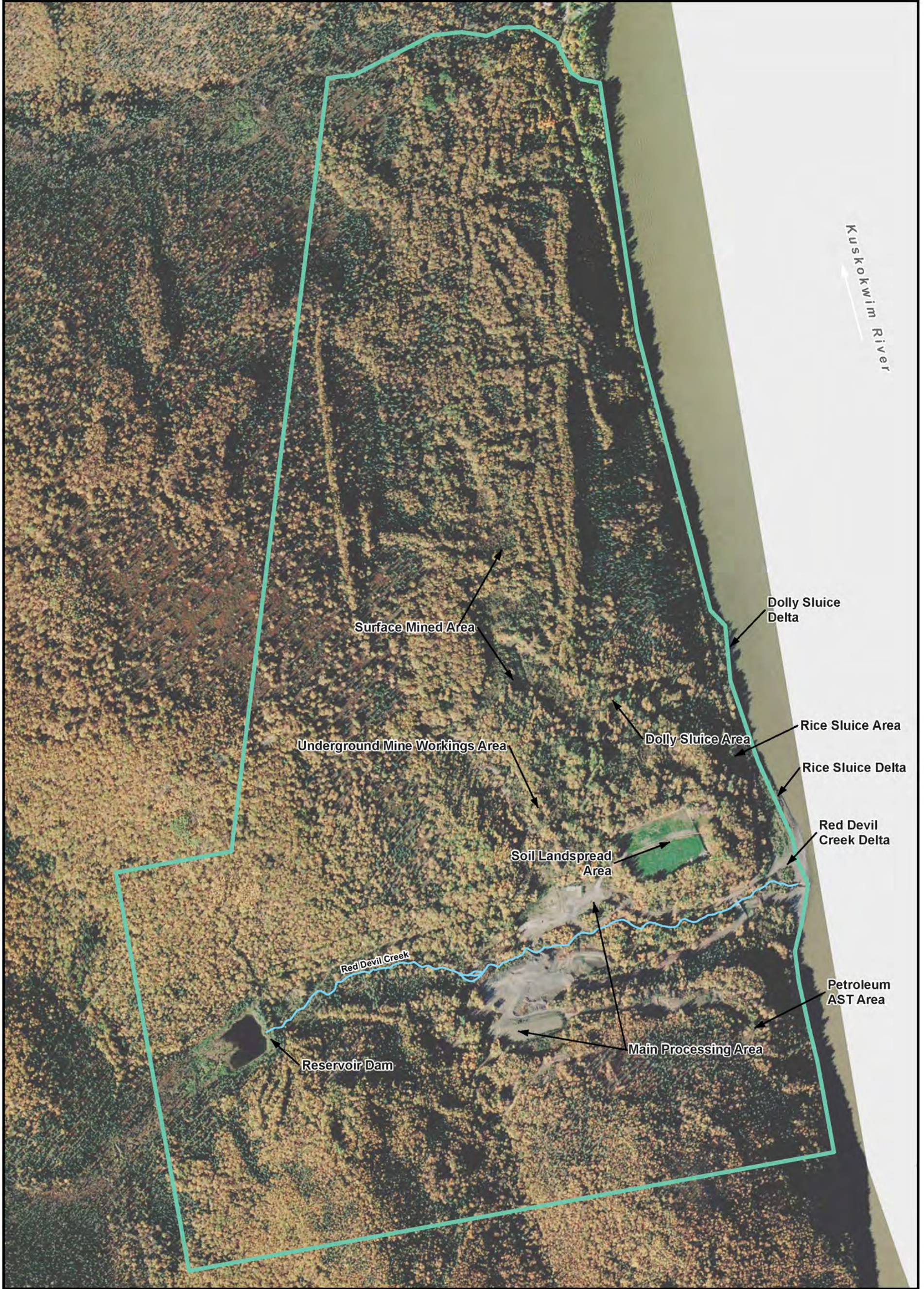
1.2 Project Location and Setting


The RDM site is located approximately 250 air miles west and 1,500 marine/river barge miles from Anchorage, Alaska. Located on the southwest bank of the Kuskokwim River, approximately 2 miles southeast of the village of Red Devil, the site is 75 air miles northeast of Aniak, the largest village in the region, and approximately 8 miles northwest of the village of Sleetmute. Approximately 15 villages are located on the 260 mile stretch downstream of Red Devil on the Kuskokwim River. The legal description for the RDM site is Township 19 North,

Range 44 West, Southeast Quarter of Section 6, Sleetmute D-4 Quadrangle, Seward Meridian. The RDM site's approximate coordinates are 61° 45' 38.1" north latitude and 157° 18' 42.7" west longitude (North American Datum 1927).

The RDM site is in a remote location, and access to the site is available by boat or barge on the Kuskokwim River or by all terrain vehicle from an airstrip at the nearby village of Red Devil.

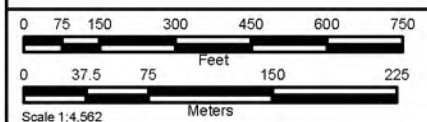




 Upland Area Encompassed by Remedial Investigation

RED DEVIL MINE
Red Devil, Alaska

Figure 1-2
Upland Area Encompassed by Remedial Investigation



2

Field Activities and Procedures

This chapter presents and discusses the results of two field events. The events were designed to capture the hydrologic conditions present during the spring and fall seasons at the site. The spring 2020 event was originally targeted for the period shortly after snow receded from the Red Devil Mine site and the seasonal ice on the Kuskokwim River broke up. Onset of the COVID-19 pandemic delayed mobilization for the spring sampling event for three weeks while the BLM and E&E worked out COVID safety procedures for the field crew and coordinated with the residents of Red Devil Village on lodging and site access using appropriate social distancing procedures. The COVID safety procedures developed for the field crew and to limit exposure to community residents were exercised during both the spring and fall sampling events.

The spring 2020 event was conducted from June 15 through June 23, 2020. The fall event was targeted to begin as late in year as possible but before the first snowfall and before limited daylight and colder temperatures would adversely affect field productivity. The fall field event occurred from September 1 to September 9, 2020.

In general, activities performed for each monitoring event include measurement of groundwater elevations, surface water discharge measurements, surface water sampling, and low-flow groundwater sampling. Specific activities for each field event are further described in Sections 2.1 through 2.2.

Photographs of the site taken during both the spring and fall 2020 field events are included as Appendix A. A field logbook was maintained throughout each sampling event. Pertinent information about the sampling locations and notes regarding flow measurements were recorded in the field logbook (see Appendix B). Additionally, field data sheets were completed using an electronic tablet and contain sample information and water quality measurements taken during purging prior to groundwater sampling.

Field activities were performed in accordance with the *Final Work Plan, Groundwater and Surface Water Baseline Monitoring, Red Devil Mine, Alaska* (Work Plan) (E & E 2019a), and the addendum to the 2019 Work Plan (E & E, email communication, dated August 29, 2020).

2.1 Groundwater Monitoring

2.1.1 Spring 2020 Baseline Monitoring

Groundwater monitoring during the spring 2020 baseline monitoring event consisted of:

- Measuring static water levels at all accessible monitoring wells at the RDM site in a single day in order to collect a “snapshot” of groundwater levels;
- Downloading of continuous water level data from pressure transducers and data-loggers installed in a network of monitoring wells; and
- Collecting groundwater samples from 24 existing monitoring wells.

The groundwater static water levels were measured on June 16, 2020. Static water level measurements were augmented with the continuous water-level measurements collected from selected wells using pressure transducers and data-loggers between the fall of 2017 and spring 2020, as described in the Work Plan (E & E 2019). Pressure transducer data recorded between September 2019 and June 2020 were downloaded during the spring 2020 field event, and the transducers were then reinstalled in wells MW50, MW51, MW53, MW54, MW56, MW57, and MW58.

Table 2-1 provides a summary of the groundwater samples collected during the spring 2020 field event. Monitoring locations are illustrated in Figure 2-1. Groundwater samples were collected for laboratory analysis of the following using the methods identified in Table 2-1:

- Total target analyte list (TAL) metals
- Total low-level mercury
- Dissolved low-level mercury
- Total suspended solids (TSS)
- Inorganic ions
- Carbonate alkalinity as calcium carbonate (CaCO₃)
- Nitrate/nitrite as nitrogen (N)

Field water quality measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected at each monitoring well prior to sample collection.

Groundwater samples were collected using a low-flow sampling technique with a maximum flow rate of 0.5 liters per minute following sampling methodologies described in the Work Plan (E & E 2019a). The type of pump used to perform the low-flow purging and sampling at each well is identified in Table 2-1.

2.1.2 Fall 2020 Baseline Monitoring

Groundwater monitoring during the fall 2020 baseline monitoring event consisted of:

- Installing new well caps for dedicated bladder pumps into 14 monitoring wells;
- Measuring static water levels at all accessible monitoring wells at the RDM site in a single day;
- Downloading continuous water level data from pressure transducers and data-loggers installed in a network of monitoring wells; and
- Collecting groundwater samples from 24 existing monitoring wells.

The groundwater static water levels were measured on September 1, 2020. Static water-level measurements were augmented with the continuous water level measurements collected using pressure transducers between the spring of 2020 and fall 2020, as described in the Work Plan (E & E 2019a). Pressure transducer data recorded between June 2020 and September 2020 were downloaded during the fall 2020 field event, and the transducers were then reinstalled in wells MW50, MW51, MW53, MW54, MW56, MW57, and MW58.

Table 2-1 provides a summary of the groundwater samples collected during the fall 2019 field event. Monitoring locations are illustrated in Figure 2-1. Groundwater samples were collected for laboratory analysis of the following using the methods identified in Table 2-1:

- Total TAL inorganic elements
- Total low-level mercury
- Dissolved low-level mercury
- Inorganic ions
- Nitrate/nitrite as N
- Carbonate alkalinity as CaCO₃
- TSS

Field water quality measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected at each monitoring well prior to sample collection.

Groundwater samples were collected using a low-flow sampling technique with a maximum flow rate of 0.5 liters per minute following sampling methodologies described in the Work Plan (E & E 2019a).

2.2 Red Devil Creek Surface Water Monitoring

During the spring and fall 2020 baseline monitoring events, surface water monitoring was conducted at five locations along Red Devil Creek between the creek's mouth at the Kuskokwim River and the reservoir south of the Main Processing Area (MPA). Surface water monitoring locations are illustrated on Figure 2-1. Table 2-2 provides a summary of the samples collected. Surface monitoring consisted of measuring stream flow and collecting surface water samples. Surface water discharge was measured using the mid-section method at creek monitoring locations following the mid-section methodology described in the Work Plan (E & E 2019a). At the seep (RD05), discharge was measured using the timed fill method described in the Work Plan (E & E 2019a).

Red Devil Creek surface water samples were collected for laboratory analysis of the following using the methods identified in Table 2-2:

- Total TAL metals
- Dissolved TAL metals
- Total low-level mercury
- Dissolved low-level mercury
- Total organic carbon
- TSS
- TDS
- Inorganic ions
- Carbonate alkalinity as CaCO_3
- Nitrate/nitrite as N

Field water quality measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected at each sample station.

Surface water samples were collected using a battery-operated peristaltic pump outfitted with certified-clean, dedicated silicone tubing following sampling methodologies described in the Work Plan (E & E 2019a).

2.3 Sample Handling

Sample handling (e.g., chain-of-custody and field documentation, etc.) during the spring and fall 2020 baseline monitoring events was conducted as described in the Work Plan (E & E 2019a).

2.4 Quality Control Samples

Field quality control (QC) samples were collected for all matrices and analytes following the requirements specified in the Work Plan (E & E 2019a).

2.5 Investigation-Derived Waste Management

Investigation-derived waste (IDW) generated during the spring and fall 2020 baseline monitoring events included the following:

- Monitoring well purge water;
- Used dedicated sampling equipment, personal protective equipment, and paper towels; and
- Decontamination fluids generated during groundwater sampling.

IDW was managed in accordance with the Work Plan (E & E 2019a).

Table 2-1 Groundwater Sample Collection

Monitoring Well ID	Sampling Method	Sample Analyses and Methods						
		Total TAL Metals	Total Low-Level Hg	Dissolved Low-Level Hg	Total Suspended Solids	Inorganic Ions	Carbonate Alkalinity as CaCO3	Nitrate Nitrite as N
		EPA 6010C/6020A	EPA 1631E	EPA 1631E	SM 2540D	MCAWW 300.0	SM 2320B	MCAWW 353.2
MW10	Bladder	•	•	•	•	•	•	•
MW16	Peristaltic	•	•	•	•	•	•	•
MW17	Peristaltic	•	•	•	•	•	•	•
MW27	Bladder	•	•	•	•	•	•	•
MW28	Bladder	•	•	•	•	•	•	•
MW06	Peristaltic	•	•	•	•	•	•	•
MW40	Bladder	•	•	•	•	•	•	•
MW42	Bladder	•	•	•	•	•	•	•
MW43	Bladder	•	•	•	•	•	•	•
MW44	Bladder	•	•	•	•	•	•	•
MW45	Bladder	•	•	•	•	•	•	•
MW46	Bladder	•	•	•	•	•	•	•
MW47	Bladder	•	•	•	•	•	•	•
MW48	Peristaltic	•	•	•	•	•	•	•
MW50	Bladder	•	•	•	•	•	•	•
MW51	Bladder	•	•	•	•	•	•	•
MW52	Bladder	•	•	•	•	•	•	•
MW53	Bladder	•	•	•	•	•	•	•
MW54	Bladder	•	•	•	•	•	•	•
MW55	Peristaltic	•	•	•	•	•	•	•
MW56	Bladder	•	•	•	•	•	•	•
MW57	Bladder	•	•	•	•	•	•	•
MW58	Bladder	•	•	•	•	•	•	•
MW59	Bladder	•	•	•	•	•	•	•

Key:

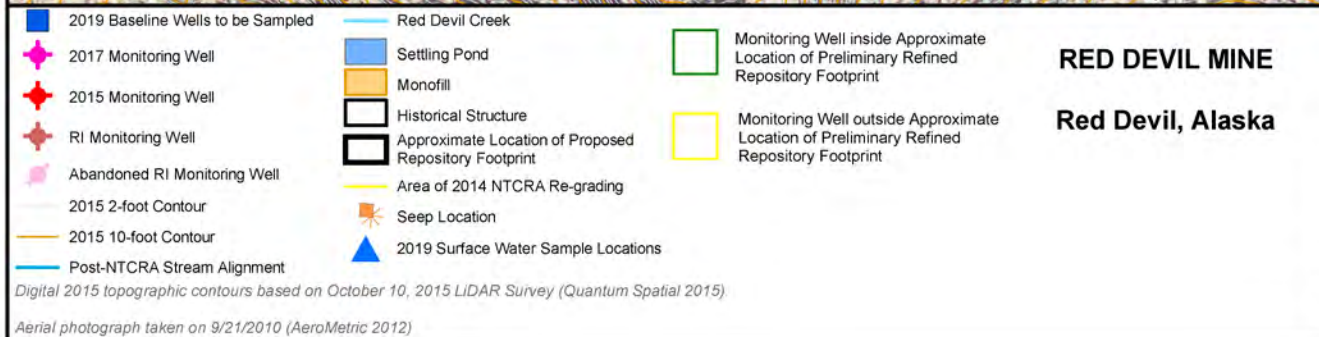
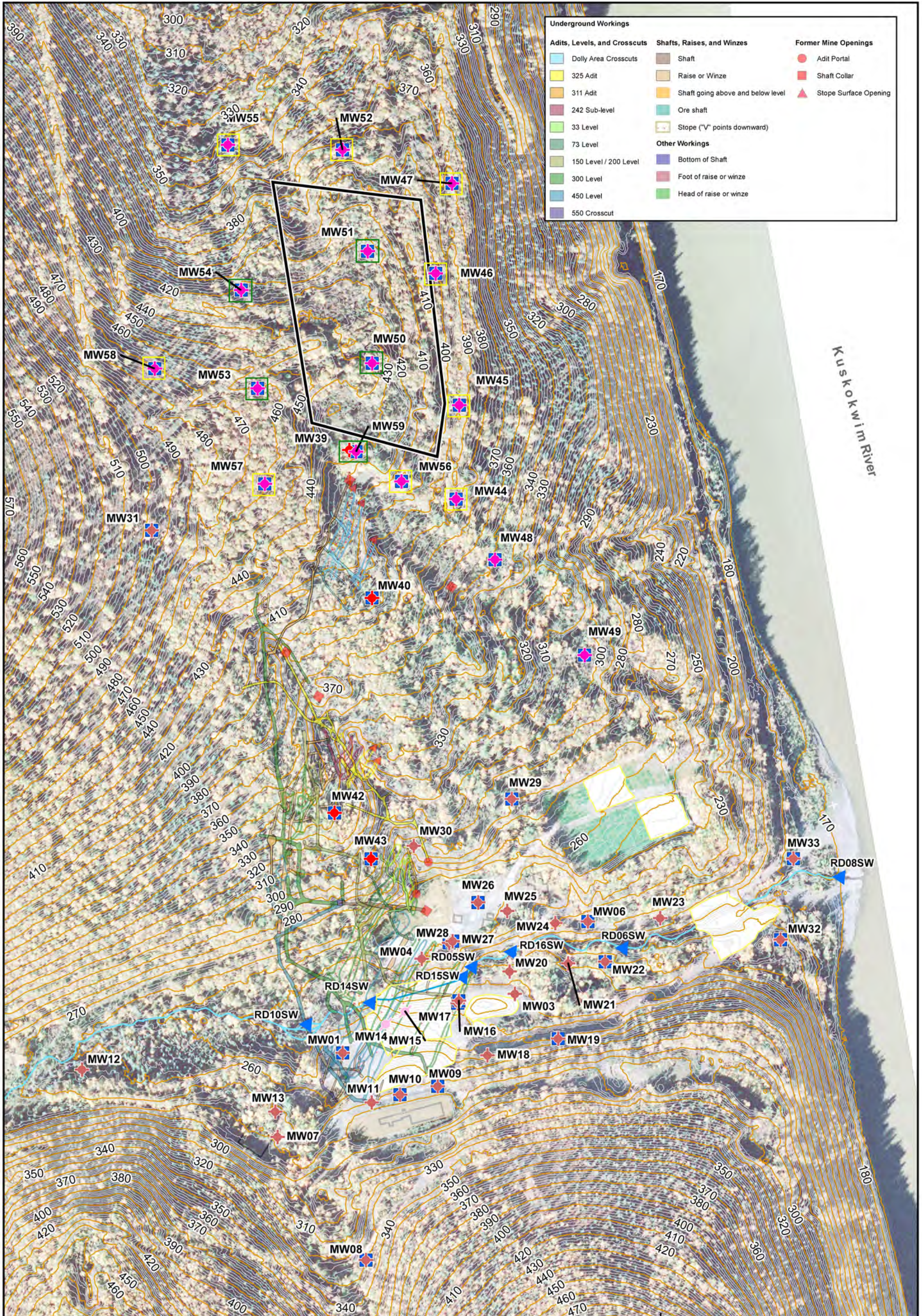
- CaCO3 = calcium carbonate
- EPA = U.S. Environmental Protection Agency
- Hg = mercury
- MCAWW = Methods for Chemical Analysis of Water and Wastes
- N = nitrogen
- TAL = Target Analyte List

Table 2-2 Surface Water Sample Collection

Sample Location ID	Location Description	Sample Analyses and Methods									
		Total TAL Metals	Dissolved TAL Metals	Total Low-Level Hg	Dissolved Low-Level Hg	Total Organic Carbon	Total Suspended Solids	Total Dissolved Solids	Inorganic Ions	Carbonate Alkalinity as CaCO ₃	Nitrate Nitrite as N
		EPA 6010C/6020A	EPA 6010C/6020A	EPA 1631E	EPA 1631E	SW846 9060	SM 2540D	SM 2540C	MCAWW 300.0	SM 2320B	MCAWW 353.2
RD10SW	Red Devil Creek, downstream of the reservoir, upstream of NTCRA	•	•	•	•	•	•	•	•	•	•
RD15SW	Red Devil Creek, new station immediately downstream of the newly aligned section (post-NTCRA) of Red Devil Creek, near former baseline monitoring station RD13SW	•	•	•	•	•	•	•	•	•	•
RD05SW	Seep on left bank of Red Devil Creek	•	•	•	•	•	•	•	•	•	•
RD06SW	Red Devil Creek, near Settling Pond #3	•	•	•	•	•	•	•	•	•	•
RD08SW	Red Devil Creek, near confluence of Red Devil Creek and Kuskokwim River, downstream of sediment trap constructed during NTCRA	•	•	•	•	•	•	•	•	•	•

Key:

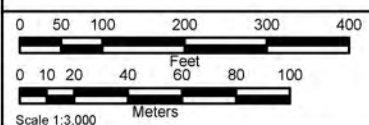
- CaCO₃ = calcium carbonate
- EPA = Environmental Protection Agency
- Hg = Mercury
- MCAWW = Methods for Chemical Analysis of Water and Wastes
- N = nitrogen
- NTCRA = non-time-critical removal action
- TAL = Target Analyte List



Digital 2015 topographic contours based on October 10, 2015 LIDAR Survey (Quantum Spatial 2015)
Aerial photograph taken on 9/21/2010 (AeroMetric 2012)

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Figure 2-1
2019 Baseline Monitoring
Surface water and Monitoring Well
Locations



Scale 1:3,000

3

Baseline Monitoring Results

This section presents results of the 2020 baseline groundwater and surface water monitoring events.

3.1 Groundwater Elevation and Surface Water Discharge Monitoring

3.1.1 Spring 2020

Depth to groundwater measurements and calculated groundwater elevations for wells monitored during the spring 2020 baseline monitoring event are presented in Table 3-1. Estimated surface water discharge calculations for Red Devil Creek surface water stations monitored during the spring 2020 baseline monitoring event are presented in Table 3-2. Based on static water elevations, stream elevations, and discharge measurements along Red Devil Creek, a groundwater potentiometric surface and surface water discharge map for the spring 2020 baseline monitoring was generated and is presented as Figure 3-1. Pressure transducer data-logger files containing depth of submersion time series data were corrected for barometric pressure and converted to groundwater elevations. The resulting groundwater elevation time series plots are presented as Fig 3-3. Observed groundwater elevations and Red Devil Creek stream discharges for spring 2020 are notably lower than previous spring monitoring events, possibly due to a later (mid-June) mobilization.

3.1.2 Fall 2020

Depth to groundwater measurements and calculated groundwater elevations for wells monitored during the fall 2020 baseline monitoring event are presented in Table 3-1. Estimated surface water discharge calculations for Red Devil Creek surface water stations monitored during the fall 2020 baseline monitoring event are presented in Table 3-2. Based on static water elevations, stream elevations, and discharge measurements along Red Devil Creek, a groundwater potentiometric surface and surface water discharge map for the fall 2020 baseline monitoring was generated and is presented as Figure 3-2. Pressure transducer data-logger files containing depth of submersion time series data were corrected for barometric pressure and converted to groundwater elevations. The resulting groundwater elevation time series plots are presented as Fig 3-3.

3.2 Spring 2020 Groundwater and Surface Water Sampling

3.2.1 Groundwater

Analytical results of groundwater sampling conducted during the spring 2020 baseline monitoring event are presented in Table 3-3. Data quality assurance review memoranda are provided in Appendix C. Maps of all sampling locations with corresponding analytical results for total antimony, total arsenic, and total and dissolved mercury are presented as Figures 3-4 through 3-6.

The following issues with data usability were noted:

- Analysis of inorganic ions was requested but not performed by the laboratory before the end of the sample holding time. Refer to the data quality assurance memo (see Appendix C) for more details.

3.2.2 Surface Water

Analytical results of surface water sampling conducted during the spring 2020 baseline monitoring event are presented in Table 3-4. Data quality assurance review memoranda are provided in Appendix C. Maps of all sampling locations with corresponding analytical results for total and dissolved antimony, arsenic, and mercury are presented as Figures 3-4 through 3-6.

3.3 Fall 2020 Groundwater and Surface Water Sampling

3.3.1 Groundwater

Analytical results of groundwater sampling conducted during the fall 2020 baseline monitoring event are presented in Table 3-5. Data quality assurance review memoranda are provided in Appendix C.

Maps of all sampling locations with corresponding analytical results for total antimony, total arsenic, and total and dissolved mercury are presented as Figures 3-7 through 3-9.

3.3.2 Surface Water

Analytical results of surface water sampling conducted during the fall 2020 baseline monitoring event are presented in Table 3-6. Data quality assurance review memoranda are provided in Appendix C. Maps of all sampling locations with corresponding analytical results for total and dissolved antimony, arsenic, and mercury are presented as Figures 3-7 through 3-9.

Table 3-2. Red Devil Creek and Seep Discharge

Monitoring Location ¹	Estimated Discharge (cfs)													
	August 18, 2011	May 26, 2012	September 12, 2012	June 19, 2015	September 2, 2015	September 28 & 29, 2016	June 1, 2017 ²	September 16, 2017	September 27, 2017	May 19, 2018	May 18, 2019	September 10, 2019 ²	June 17, 2020	September 2, 2020
RD02	5.96	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD03	4.09	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD10	5.52	12.18	4.64	1.25	0.48	2.45	1.20	5.22	Station not monitored	11.60	11.47	0.42	0.54	0.40
RD14	Station not established	Station not established	Station not established	1.41	0.54	3.01	1.54	6.35	Station not monitored	10.84	12.87	0.37	Station not monitored	Station not monitored
RD04	5.95	12.67	3.45	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD12	8.24	10.53	3.79	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD13	Station not established	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD15	Station not established	Station not established	Station not established	1.40	0.67	3.53	1.91	6.85	Station not monitored	15.80	13.04	0.41	0.88	0.39
RD05 (seep)	0.18	Station not monitored	0.16	0.23	0.19	0.35	0.01	0.05	Station not monitored	0.33	0.12	0.01	0.17	0.03
RD16	Station not established	Station not established	Station not established	1.61	0.60	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	12.14	0.47	Station not monitored	Station not monitored
RD09	5.98	13.36	3.40	1.40	0.80	2.43	1.55	6.23	Station not monitored	14.87	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD06	6.81	14.47	3.80	1.54	0.79	5.51	1.26	7.08	Station not monitored	13.69	15.15	0.33	1.11	0.43
RD07	7.61	Station not monitored	3.61	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored	Station not monitored
RD08	7.19	14.20	3.09	1.90	0.81	Station Inaccessible	2.15	7.38	5.21	10.41	13.12	0.26	1.28	0.44

Notes:

¹ Locations are organized from upstream to downstream along Red Devil Creek

² Flow at RD05 measured using 'bucket method.' Water was collected in a 5-liter volumetric container for 10 seconds. This process was repeated 5 times to generate an average volume per time.

Key:

cfs = Cubic feet per second

Table 3-3. Groundwater Sample Results, Spring 2020

Analyte	Station ID		Units	MW51	MW52	MW53	MW54	MW55	MW56	MW57	MW58	MW59									
	Geographic Area			Vicinity of the Proposed Repository																	
	Sample ID			0620MW51GW	0620MW52GW	0620MW53GW	0620MW54GW	0620MW55GW	0620MW56GW	0620MW57GW	0620MW58GW	0620MW59GW									
	Method																				
Aluminum	Metals (ICP)	SW846 6010B	µg/L	160	J	110	U	110	U	110	U	110	U	110	U	110	U				
Antimony	Metals (ICP/MS)	SW846 6020A	µg/L	0.55	U	0.55	U	0.55	U	0.96	J	9.2		1.1	J	0.55	U	0.55	U		
Arsenic	Metals (ICP/MS)	SW846 6020A	µg/L	3.9	J	7.8		1	U	46		25		1.2	J	1	U	2.3	J	63	
Barium	Metals (ICP/MS)	SW846 6020A	µg/L	37		10		140		130		110		82		4.6	J	100		330	
Beryllium	Metals (ICP/MS)	SW846 6020A	µg/L	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U
Cadmium	Metals (ICP/MS)	SW846 6020A	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Calcium	Metals (ICP)	SW846 6010B	µg/L	25000		13000		25000		43000		27000		49000		8100		30000		56000	
Chromium	Metals (ICP/MS)	SW846 6020A	µg/L	0.87	U	1.5	J	0.87	U	0.87	U	0.87	U	0.87	U	0.93	J	0.87	U	0.87	U
Cobalt	Metals (ICP/MS)	SW846 6020A	µg/L	0.85	J	0.53	J	0.2	U	1.2	J	6.6		1.8	J	0.2	U	0.36	J	1.2	J
Copper	Metals (ICP/MS)	SW846 6020A	µg/L	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
Iron	Metals (ICP)	SW846 6010B	µg/L	360	J	140	U	140	U	2600		20000		140	U	140	U	1500		1300	
Lead	Metals (ICP/MS)	SW846 6020A	µg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Magnesium	Metals (ICP)	SW846 6010B	µg/L	22000		7300		14000		41000		19000		45000		4200		23000		54000	
Manganese	Metals (ICP/MS)	SW846 6020A	µg/L	95		33		43		320		1700		960		2.3	U	92		420	
Mercury	Mercury (CVAA)	SW846 7470A	µg/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U
Nickel	Metals (ICP/MS)	SW846 6020A	µg/L	1	U	2.2	J	0.67	J	5.3	J	9.7	J	8.4	J	1.4	J	2	J	3.6	J
Potassium	Metals (ICP)	SW846 6010B	µg/L	410	U	410	U	410	U	550	J	760	J	540	J	410	U	440	J	690	
Selenium	Metals (ICP/MS)	SW846 6020A	µg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Silver	Metals (ICP/MS)	SW846 6020A	µg/L	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
Sodium	Metals (ICP)	SW846 6010B	µg/L	770	J	2900		2300		2100		6100		470	J	2600		1800	J	1800	
Thallium	Metals (ICP/MS)	SW846 6020A	µg/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Vanadium	Metals (ICP/MS)	SW846 6020A	µg/L	3.3	J	4.1	J	4.1	J	3	J	3.4	J	2.5	J	3.1	J	3.3	J	3.1	J
Zinc	Metals (ICP/MS)	SW846 6020A	µg/L	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	80				28	J
Total Low Level Mercury																					
Mercury	Total Mercury by EPA 1631	EPA 1631	ng/L	18.7		41.7		31.9		10.1		92.5		39.8		37.0		2.29		21.5	
Dissolved Low Level Mercury																					
Mercury	Dissolved Mercury by EPA 1631	EPA 1631	ng/L	2.90		7.23		9.72		0.23	J	45.1		6.56		16.0		0.57		10.8	
General Chemistry																					
Alkalinity	Alkalinity	SM 2320B	mg/L	110		51	J	99		230		120		280		35		150		290	
Bicarbonate Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	110		51	J	99		230		120		280		35		150		290	
Carbonate Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	
Chloride	Anions, Ion Chromatography	MCAWW 300.0	mg/L																		
Fluoride	Anions, Ion Chromatography	MCAWW 300.1	mg/L																		
Hydroxide Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	
Nitrate Nitrite as N	Nitrogen, Nitrate-Nitrite	MCAWW 353.2	mg/L	0.06	U	1.6		0.11	J	0.06	U	0.06	U	0.29		0.15		0.06	U	0.06	
Sulfate	Anions, Ion Chromatography	MCAWW 300.2	mg/L																		
Total Suspended Solids	Solids, Total Suspended (TSS)	SM 2540D	mg/L	2.7		2.6		2	U	4		39		10		2	U	2	U	6.2	
Field Water Quality Parameters																					
Temperature	Field Measurement		Deg C	5.04		4.58		3.64		5.85		4.75		4.26		4.17		7.49		6.91	
pH	Field Measurement		pH Units	6.7		6.22		6.57		6.67		5.93		6.89		6.21		7.42		6.31	
Conductivity	Field Measurement		mS/cm	0.18		0.086		0.135		0.338		0.238		0.334		0.55		0.23		0.432	
Turbidity	Field Measurement		NTU	10.73		8.03		1.46		3.44		31.48		5.11		0.97		2.49		6.12	
Dissolved Oxygen	Field Measurement		mg/L	5.56		10.34		7.97		1.56		1.14		3.3		11.09		1.22		3.57	
Oxidation-Reduction Potential	Field Measurement		mV	155.1		119.3		50.6		65.9		61.2		72		211.5		21.6		85	

Key

µg/L = Micrograms per liter
 ADEC = Alaska Department of Environmental Conservation
 Deg C = Degrees Celsius
 EPA = United States Environmental Protection Agency
 GC/MS = Gas Chromatography/Mass Spectrometry
 ICP/MS = Inductively coupled plasma/mass spectrometry
 J = The analyte was detected. The associated result is estimated.
 mg/L = milligrams per liter
 mS/cm = Millisiemens per centimeter
 mV = Millivolts
 ng/L = Nanograms per liter
 NTU = Nephelometric turbidity units
 U = The analyte was analyzed for but not detected. The value provided is the method detection limit.
 UJ = The analyte was analyzed for but not detected. The associated reporting limit is estimated.

Table 3-5. Groundwater Sample Results, Fall 2020

Analyte	Station ID			MW10	MW16	MW17	MW06	MW27	MW28	MW40	MW42	MW43	MW44	MW45	MW46												
	Geographic Area			Post-1955 MPA			Pre-1955 MPA			Surface Mined Area																	
	Sample ID			0920MW10GW	0920MW16GW	0920MW17GW	0920MW06GW	0920MW27GW	0920MW28GW	0920MW40GW	0920MW42GW	0920MW43GW	0920MW44GW	0920MW45GW	0920MW46GW												
	Method																										
Aluminum	Metals (ICP)	SW846 6010B	µg/L	110	U	930	J	110	U	110	U	800	J	110	U	110	U	110	U	210	J	230	J	240	J		
Antimony	Metals (ICP/MS)	SW846 6020A	µg/L	0.86	J	340		11		7		6.3		11		5.6		250		12		0.55	U	0.55	U	0.55	U
Arsenic	Metals (ICP/MS)	SW846 6020A	µg/L	94		830		6.8		45		26		130		180		250		330		1.3	J	1.5	J	1	U
Barium	Metals (ICP/MS)	SW846 6020A	µg/L	93		90		49		45		42		63		130		120		120		37		2.9	J	5.2	J
Beryllium	Metals (ICP/MS)	SW846 6020A	µg/L	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U
Cadmium	Metals (ICP/MS)	SW846 6020A	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Calcium	Metals (ICP)	SW846 6010B	µg/L	21000		38000		27000		32000		83000		41000		46000		41000		25000		39000		22000		18000	
Chromium	Metals (ICP/MS)	SW846 6020A	µg/L	1.1	J	2.5	J	0.92	J	1.4	J	6.3		2.4	J	0.87	U	0.87	U	0.87	U	1.1	J	1.4	J	1.1	J
Cobalt	Metals (ICP/MS)	SW846 6020A	µg/L	0.2	U	14		0.2	U	1.9	J	3.8		3.2		26		3.3		37		2.7		0.2	U	0.25	J
Copper	Metals (ICP/MS)	SW846 6020A	µg/L	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
Iron	Metals (ICP)	SW846 6010B	µg/L	980		20000		140	U	4100		140	U	2200		590		460	J	2900		1000		150	J	270	J
Lead	Metals (ICP/MS)	SW846 6020A	µg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Magnesium	Metals (ICP)	SW846 6010B	µg/L	30000		70000		19000		30000		51000		31000		47000		30000		18000		33000		19000		22000	
Manganese	Metals (ICP/MS)	SW846 6020A	µg/L	150		8200		36		650		2900		850		290		570		2600		720		21		19	
Mercury	Mercury (CVAA)	SW846 7470A	µg/L	0.15	U	1.5		0.15	U	0.15	U	0.32		0.35	J	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U
Nickel	Metals (ICP/MS)	SW846 6020A	µg/L	0.62	U	7	J	0.62	U	3.1	J	60		8	J	94		19		110		3.2	J	0.69	J	1.1	J
Potassium	Metals (ICP)	SW846 6010B	µg/L	920	J	2300	J	410	U	760	J	1000	J	1000	J	820	J	590	J	480	J	550	J	520	J	490	J
Selenium	Metals (ICP/MS)	SW846 6020A	µg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Silver	Metals (ICP/MS)	SW846 6020A	µg/L	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U
Sodium	Metals (ICP)	SW846 6010B	µg/L	3200		5900		3100		4100		13000		11000		1800	J	3200		3400		2300		1300	J	1100	J
Thallium	Metals (ICP/MS)	SW846 6020A	µg/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Vanadium	Metals (ICP/MS)	SW846 6020A	µg/L	2.3	U	2.3	J	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	2.7	J	3.3	J	4	J
Zinc	Metals (ICP/MS)	SW846 6020A	µg/L	9.5	U	11	J	9.5	U	9.5	U	22	J	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U
Total Low Level Mercury																											
Mercury	Total Mercury by EPA 1631	EPA 1631	ng/L	175		1850		89.7		1.76		651		1220		2.37		63.4		1.52		13.5		25.1		17.2	
Dissolved Low Level Mercury																											
Mercury	Dissolved Mercury by EPA 1631	EPA 1631	ng/L	68.9		842		13.4		0.29	J	503		563		0.26	J	32.1		0.30	J	7.09		6.97		1.05	
General Chemistry																											
Alkalinity	Alkalinity	SM 2320B	mg/L	160		100		120		170		260		190		260		190		120		200		110		120	
Bicarbonate Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	160		100		120		170		260		190		260		190		120		200		110		120	
Carbonate Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chloride	Anions, Ion Chromatography	MCAWW 300.0	mg/L	1.4		1.3		0.14	U	1.2		1.6		0.14	UJ	1.1		0.97		1.1		1.4		1.2		1.1	
Fluoride	Anions, Ion Chromatography	MCAWW 300.1	mg/L	0.03	U	0.03	U	0.14	J	0.21		0.03	U	0.03	U	0.03	U	0.063	J	0.03	U	0.03	U	0.03	U	0.03	U
Hydroxide Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Nitrate Nitrite as N	Nitrogen, Nitrate-Nitrite	MCAWW 353.2	mg/L	0.06	U	0.06	U	0.06	U	0.06	U	0.06	U	0.06	UJ	0.06	U	0.06	U	0.06	U	0.06	U	0.49		0.43	
Sulfate	Anions, Ion Chromatography	MCAWW 300.2	mg/L	9.4		290		9.4		42		170		46	J	11		22		14		6.7		4.8		3.9	
Total Suspended Solids	Solids, Total Suspended (TSS)	SM 2540D	mg/L	2.5		35		2	U	4.8		2	U	16		2	U	2		3.6		11		2.6		4	
Field Water Quality Parameters																											
Temperature	Field Measurement		Deg C	4.72		6.89		5.59		4.67		6.1		5.42		3.71		4.87		6.09		3.36		3.51		2.75	
pH	Field Measurement		pH Units	7.31		6.21		6.88		6.11		6.25		6.86		7		6.81		6.46		8		6.42		6.62	
Conductivity	Field Measurement		mS/cm	0.232		0.462		0.155		0.233		0.574		0.33		0.354		0.246		0.168		0.234		0.135		0.132	
Turbidity	Field Measurement		NTU	2.31		24.01		0.3		1.54		0.41		20.45		0.51		3.51		0.59		9.06		7.18		8.84	
Dissolved Oxygen	Field Measurement		mg/L	11.33		2.55		8.26		0.15		1.53		0.45		0.65		2.75		0.67		4.74		8.26		4.87	
Oxidation-Reduction Potential	Field Measurement		mV	-4		33.8		165.5		47.7		222.8		41.8		24.4		110.7		59.7		10.6		278.1		320.4	

Key
µg/L = Micrograms per liter
ADEC = Alaska Department of Environmental Conservation
Deg C = Degrees Celsius
EPA = United States Environmental Protection Agency
GC/MS = Gas Chromatography/Mass Spectrometry
ICP/MS = Inductively coupled plasma/mass spectrometry
J = The analyte was detected. The associated result is estimated.
mg/L = milligrams per liter
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NTU = Nephelometric turbidity units
U = The analyte was analyzed for but not detected. The value provided is the method detection limit.
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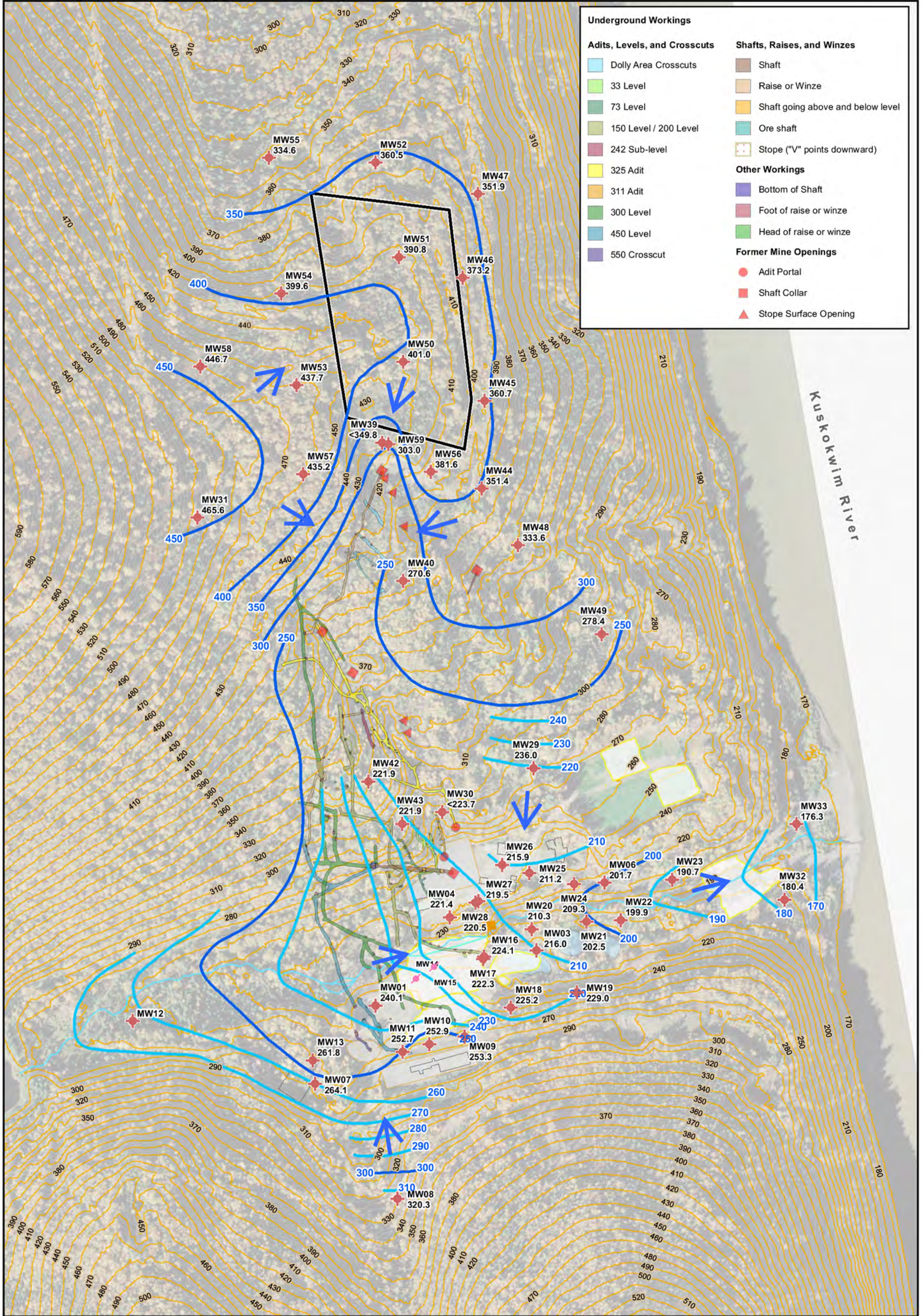
Notes
(1) Table 3-5 in the 2019 Baseline Monitoring Report has been revised to include corrected laboratory data. Refer to the Red Devil Mine 2019 Baseline Monitoring Report – Fall 2019 Analytical Data Correction Memo in the Administrative Record for corrected fall 2019 data.

Table 3-5. Groundwater Sample Results, Fall 2020

Analyte	Station ID		Units	MW47	MW48	MW50	MW51	MW52	MW53	MW54	MW55	MW56	MW57	MW58	MW59																			
	Geographic Area			Vicinity of the Proposed Repository																														
	Sample ID			0920MW47GW	0920MW48GW	0920MW50GW	0920MW51GW	0920MW52GW	0920MW53GW	0920MW54GW	0920MW55GW	0920MW56GW	0920MW57GW	0920MW58GW	0920MW59GW																			
	Method																																	
Aluminum	Metals (ICP)	SW846 6010B	µg/L	110	U	110	U	840	J	170	J	250	J	110	U	110	U	110	U	130	J	110	U	150	J	110	J							
Antimony	Metals (ICP/MS)	SW846 6020A	µg/L	0.55	U	0.55	U	12		0.55	U	3	J	0.55	U	0.55	J	6.5	U	0.55	U	0.55	U	0.55	U	0.55	U							
Arsenic	Metals (ICP/MS)	SW846 6020A	µg/L	1	U	1	U	530		5.1		22		1	U	42		19		1.8	J	1.3	J	2.5	J	62								
Barium	Metals (ICP/MS)	SW846 6020A	µg/L	1.9	J	55		310		44		150		160		140		120		61		8.2		110		330								
Beryllium	Metals (ICP/MS)	SW846 6020A	µg/L	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U							
Cadmium	Metals (ICP/MS)	SW846 6020A	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U							
Calcium	Metals (ICP)	SW846 6010B	µg/L	21000		20000		72000		27000		38000		27000		44000		31000		50000		14000		28000		56000								
Chromium	Metals (ICP/MS)	SW846 6020A	µg/L	1.9	J	7.3		3.1	J	0.98	J	2.6	J	12		15		1.7	J	1.2	J	1.2	J	0.94	J	1.2	J							
Cobalt	Metals (ICP/MS)	SW846 6020A	µg/L	0.2	U	0.2	U	3.3		1	J	13		0.47	J	1.4	J	2.4		2.5		0.2	U	0.37	J	1	J							
Copper	Metals (ICP/MS)	SW846 6020A	µg/L	3	U	3	U	3	U	3	U	3	U	3	J	3	U	3	U	3	U	3	U	3	U	3	U							
Iron	Metals (ICP)	SW846 6010B	µg/L	140	U	140	U	1900		410	J	560		140	U	2600		8100		140	U	140	U	1800		1400								
Lead	Metals (ICP/MS)	SW846 6020A	µg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U							
Magnesium	Metals (ICP)	SW846 6010B	µg/L	22000		19000		59000		23000		32000		16000		41000		24000		43000		8600		22000		52000								
Manganese	Metals (ICP/MS)	SW846 6020A	µg/L	78		12		980		110		940		86		380		720		1000		5.1	J	100		400								
Mercury	Mercury (CVAA)	SW846 7470A	µg/L	0.15	U	0.15	U	1.5		0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U							
Nickel	Metals (ICP/MS)	SW846 6020A	µg/L	0.62	U	1	J	9.4	J	1.2	J	25		1.4	J	7.3	J	5.6	J	7.2	J	2.4	J	2.5	J	3.2	J							
Potassium	Metals (ICP)	SW846 6010B	µg/L	440	J	440	J	860	J	410	U	660	J	410	U	600	J	630	J	530	J	410	U	500	J	710	J							
Selenium	Metals (ICP/MS)	SW846 6020A	µg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U							
Silver	Metals (ICP/MS)	SW846 6020A	µg/L	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U	0.28	U							
Sodium	Metals (ICP)	SW846 6010B	µg/L	2100		1700	J	2300		2100		2600		2200		1900	J	2600		1400	J	2400		1500	J	1700	J							
Thallium	Metals (ICP/MS)	SW846 6020A	µg/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U							
Vanadium	Metals (ICP/MS)	SW846 6020A	µg/L	4.2	J	3.3	J	4	J	4.3	J	3.9	J	4.1	J	2.6	J	2.9	J	2.7	J	4	J	3	J	2.7	J							
Zinc	Metals (ICP/MS)	SW846 6020A	µg/L	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U							
Total Low Level Mercury																																		
Mercury	Total Mercury by EPA 1631	EPA 1631	ng/L	0.34	J	4.79		1680		7.74		131		71.2		3.50		38.1		27.6		38.7		15.8		19.2								
Dissolved Low Level Mercury																																		
Mercury	Dissolved Mercury by EPA 1631	EPA 1631	ng/L	2.81		3.07		240		1.12		4.85		11.8		0.14	U	25.7		1.20		14.4		0.59	J	3.48								
General Chemistry																																		
Alkalinity	Alkalinity	SM 2320B	mg/L	120		110		360		140		200		110		240		160		260		60		140		300								
Bicarbonate Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	120		110		360		140		200		110		240		160		260		60		140		300								
Carbonate Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U							
Chloride	Anions, Ion Chromatography	MCAWW 300.0	mg/L	1.2		0.14	U	1.2		0.95		0.99		1.3		0.96		0.14	U	0.96		1.1		0.81	J	1.2								
Fluoride	Anions, Ion Chromatography	MCAWW 300.1	mg/L	0.03	U	0.14	J	0.03	U	0.03	U	0.03	U	0.03	U	0.22		0.076	J	0.12	J	0.13	J	0.063	J	0.03	U							
Hydroxide Alkalinity as CaCO3	Alkalinity	SM 2320B	mg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U							
Nitrate Nitrite as N	Nitrogen, Nitrate-Nitrite	MCAWW 353.2	mg/L	0.27		1.2	J	0.06	UJ	0.06	U	0.21		0.1	J	0.06	U	0.06	U	0.59		0.15		0.06	U	0.06	U							
Sulfate	Anions, Ion Chromatography	MCAWW 300.2	mg/L	4.5		4	J	8.5		2.2		5.7		5		9.7		8		5.5		3.9		8.9		5.6								
Total Suspended Solids	Solids, Total Suspended (TSS)	SM 2540D	mg/L	2	U	2	U	22		4.2		19		4.8		3.2		7		5.8		2	U	4.6		6.8								
Field Water Quality Parameters																																		
Temperature	Field Measurement		Deg C	2.89		4.15		3.9		4.11		3.64		5.44		3.55		3.44		3.8		3.27		4.41		5.64								
pH	Field Measurement		pH Units	6.48		6.22		6.62		6.72		6.44		8.25		7.02		6.1		6.66		6.32		7.41		6.97								
Conductivity	Field Measurement		mS/cm	0.14		0.132		0.388		0.165		0.392		0.146		0.272		0.199		0.287		0.076		0.176		0.363								
Turbidity	Field Measurement		NTU	1.53		0.51		22.03		7.72		37.21		4.91		2.92		2.09		7.51		3.05		9.07		9.48								
Dissolved Oxygen	Field Measurement		mg/L	5.44		5.26		3.6		4.42		10.78		4.99		10.86		7.9		1.38		6.81		2.05		4.2								
Oxidation-Reduction Potential	Field Measurement		mV	341.8		266.9		51.2		193.5		299.4		37.3		-7.3		57.5		295.6		181.4		-33.8		-16.1								

Key
µg/L = Micrograms per liter
ADEC = Alaska Department of Environmental Conservation
Deg C = Degrees Celsius
EPA = United States Environmental Protection Agency
GC/MS = Gas Chromatography/Mass Spectrometry
ICP/MS = Inductively coupled plasma/mass spectrometry
J = The analyte was detected. The associated result is estimated.
mg/L = milligrams per liter
mS/cm = Millisiemens per centimeter
mV = Millivolts
ng/L = Nanograms per liter
NTU = Nephelometric turbidity units
U = The analyte was analyzed for but not detected. The value provided is the method detection limit.
UJ = The analyte was analyzed for but not detected. The associated reporting limit is estimated.

Notes
(1) Table 3-5 in the 2019 Baseline Monitoring Report has been revised to include corrected laboratory data. Refer to the Red Devil Mine 2019 Baseline Monitoring Report – Fall 2019 Analytical Data Correction Memo in the Administrative Record for corrected fall 2019 data.



Monitoring Well
 Abandoned RI Monitoring Well
 Seep Location

2015 10-foot Contour
 2015 2-foot Contour
 Post-NTCRA Stream Alignment
 Red Devil Creek
 10-Foot Groundwater Contour
 50-Foot Groundwater Contour

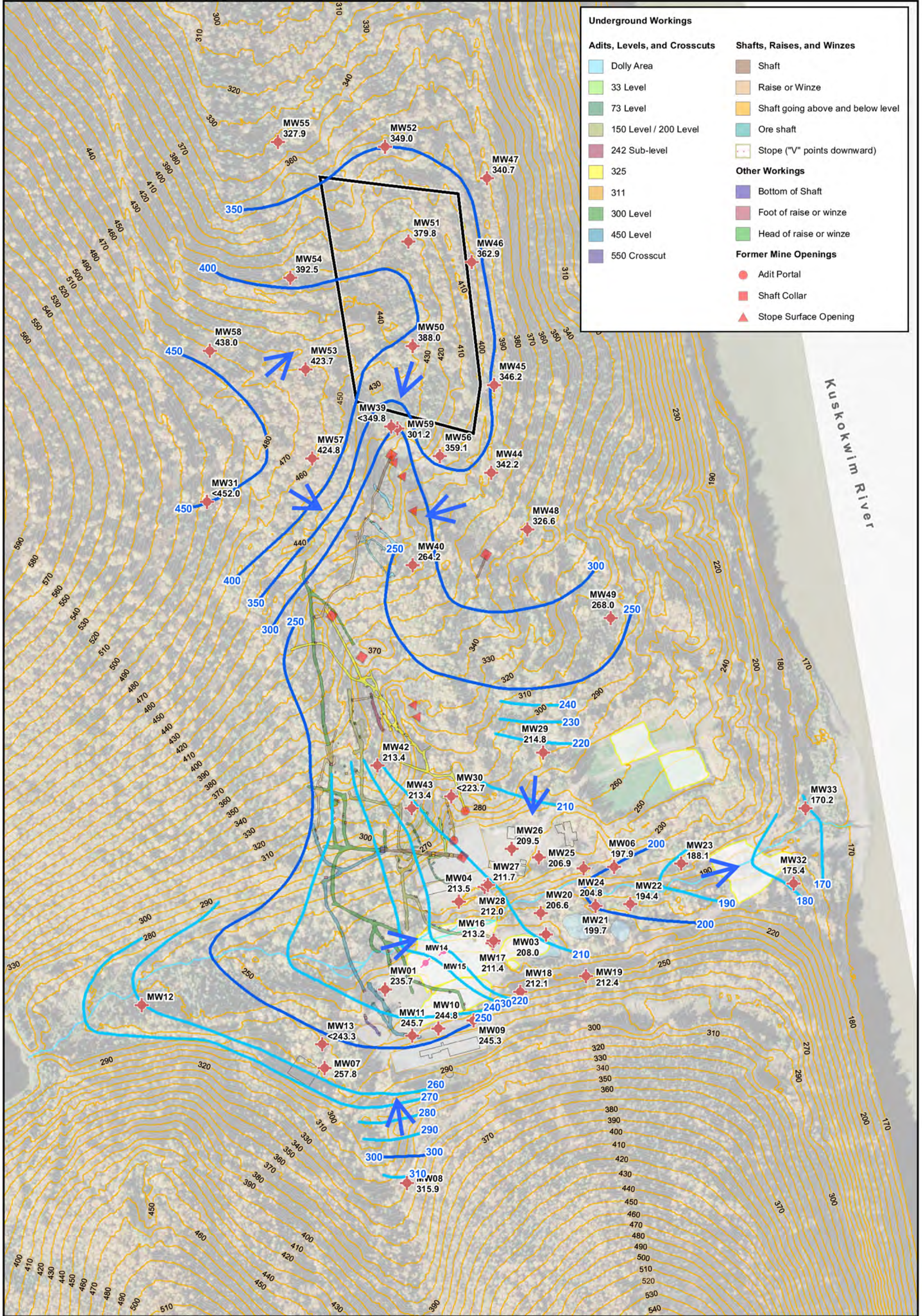
Settling Pond
 Monofill
 Historical Structure
 Repository Footprint
 Area of 2014 NTCRA Re-grading
 General flow direction of shallow groundwater

RED DEVIL MINE
 Red Devil, Alaska

Figure 3-1
Groundwater Potentiometric Surface, Spring 2020

0 50 100 200 300 400
 Feet
 0 12.5 25 50 75 100 125
 Meters

Groundwater elevations are in feet NAVD88
 Digital 2015 topographic contours based on October 10, 2015 LIDAR Survey (Quantum Spatial 2015)
 Aerial photograph taken on September 21, 2010 (AeroMetric 2012)



Groundwater elevations are in feet NAVD88
 Digital 2015 topographic contours based on October 10, 2015 LIDAR Survey (Quantum Spatial 2015)
 Aerial photograph taken on September 21, 2010 (AeroMetric 2012)

RED DEVIL MINE
 Red Devil, Alaska

Figure 3-2
 Groundwater Potentiometric
 Surface, Fall 2020

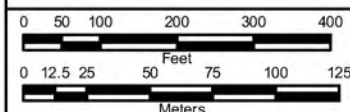
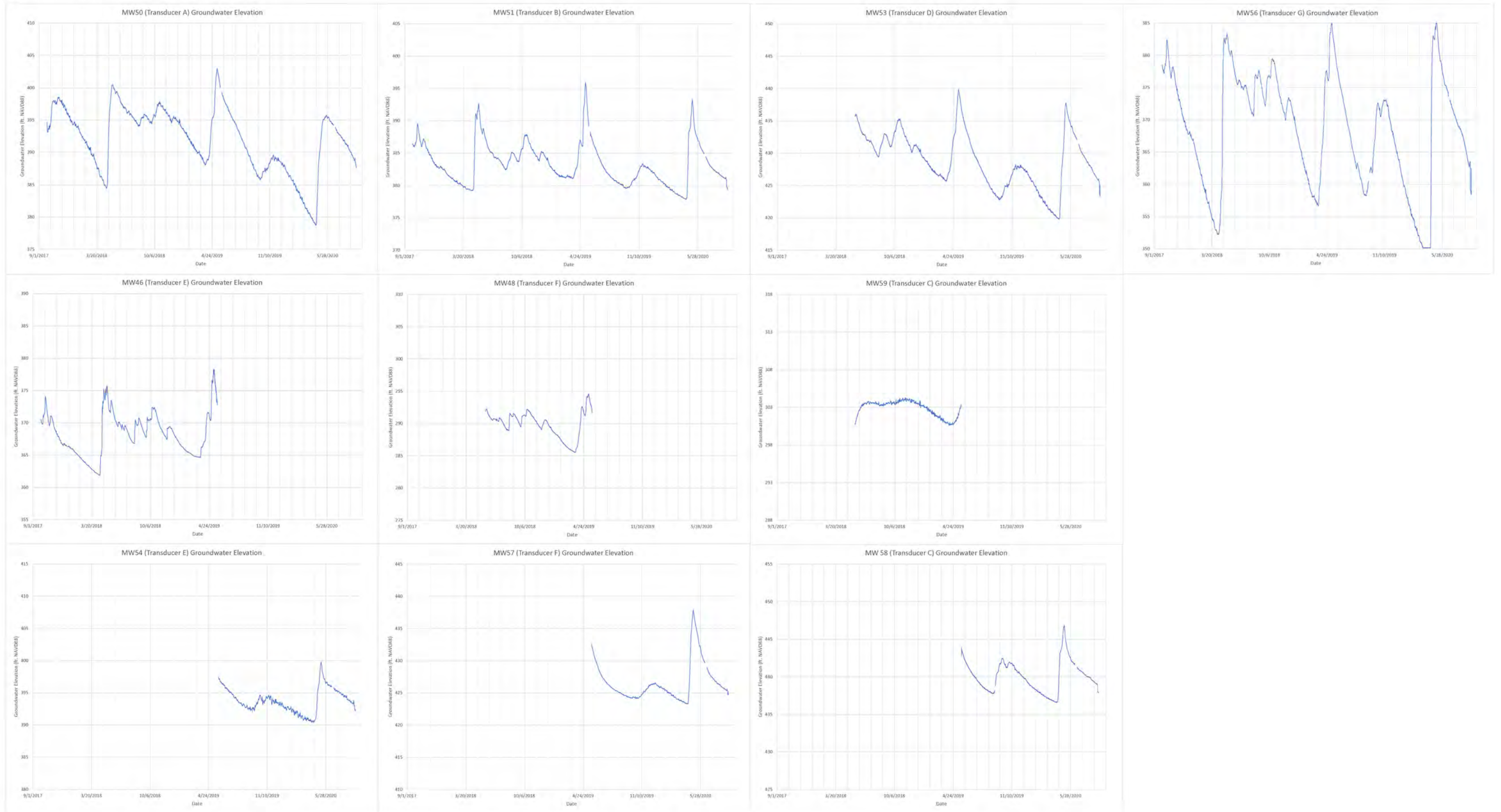
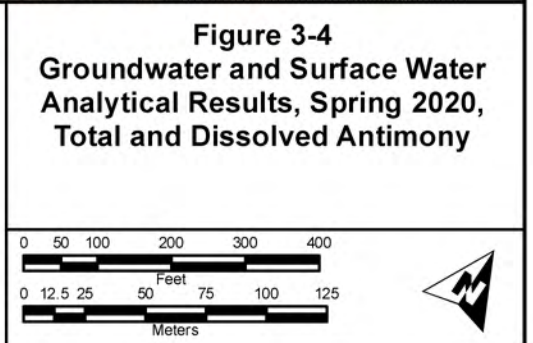
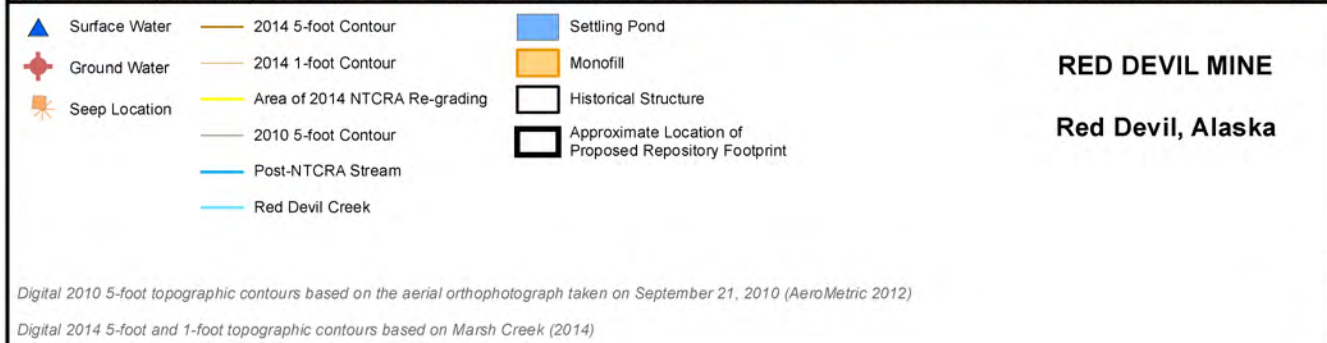
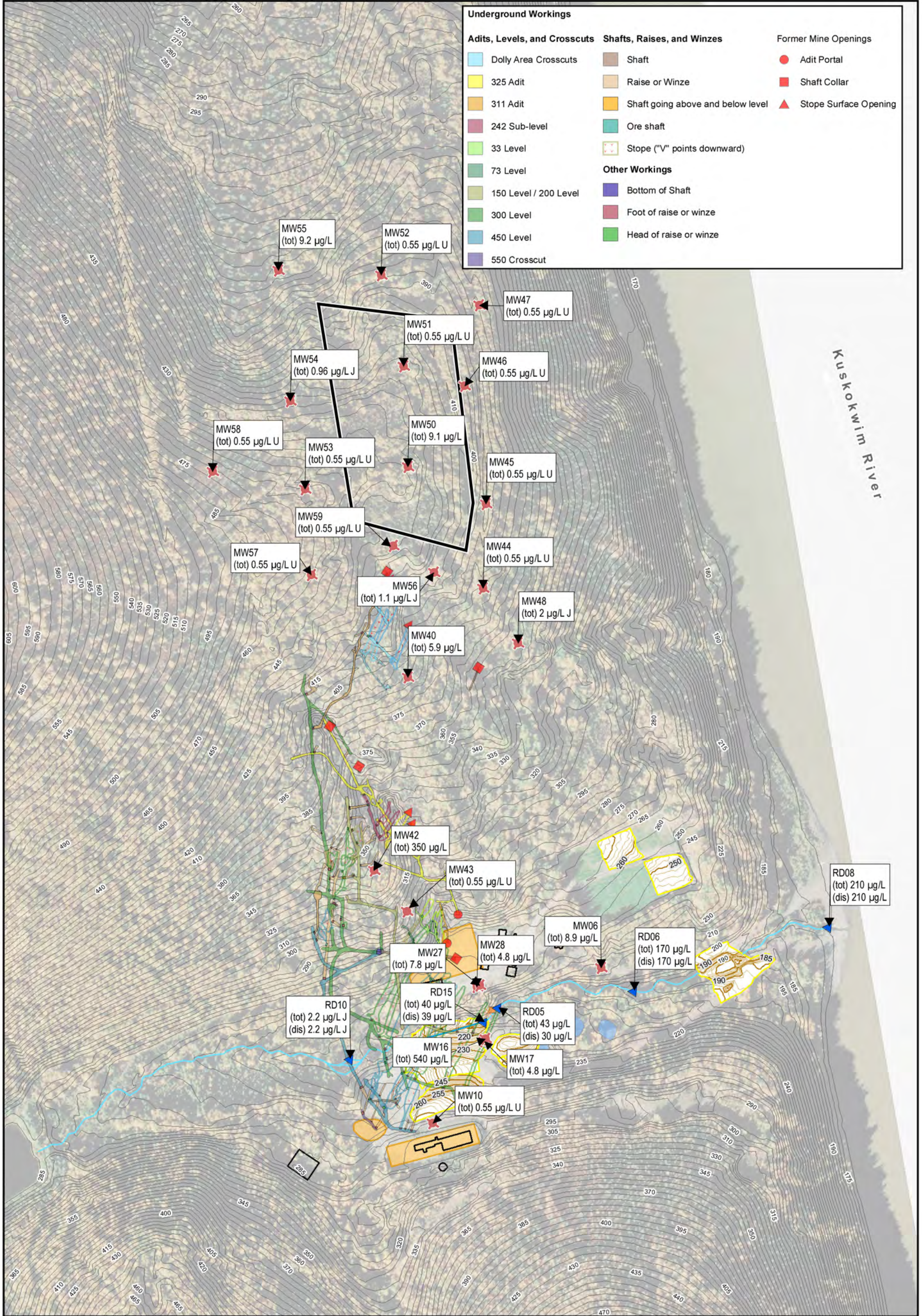
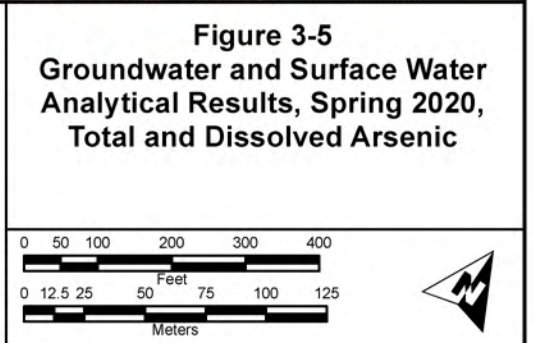
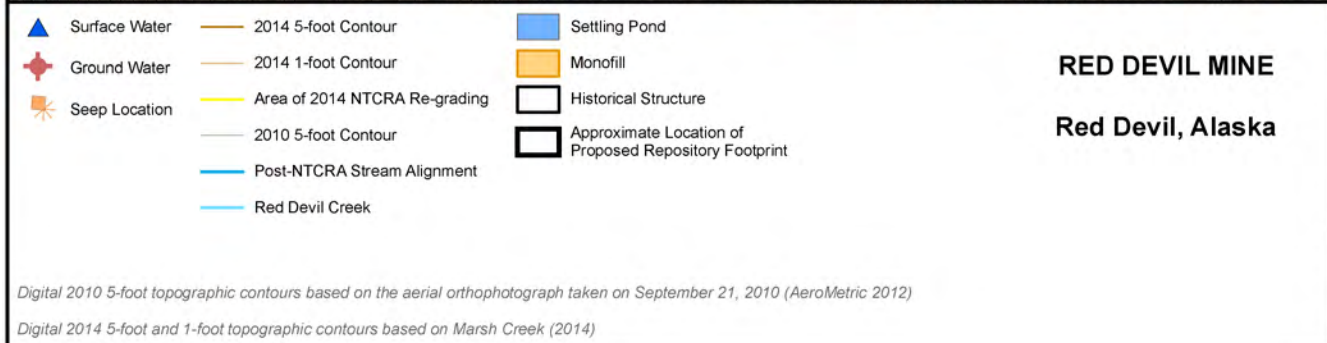
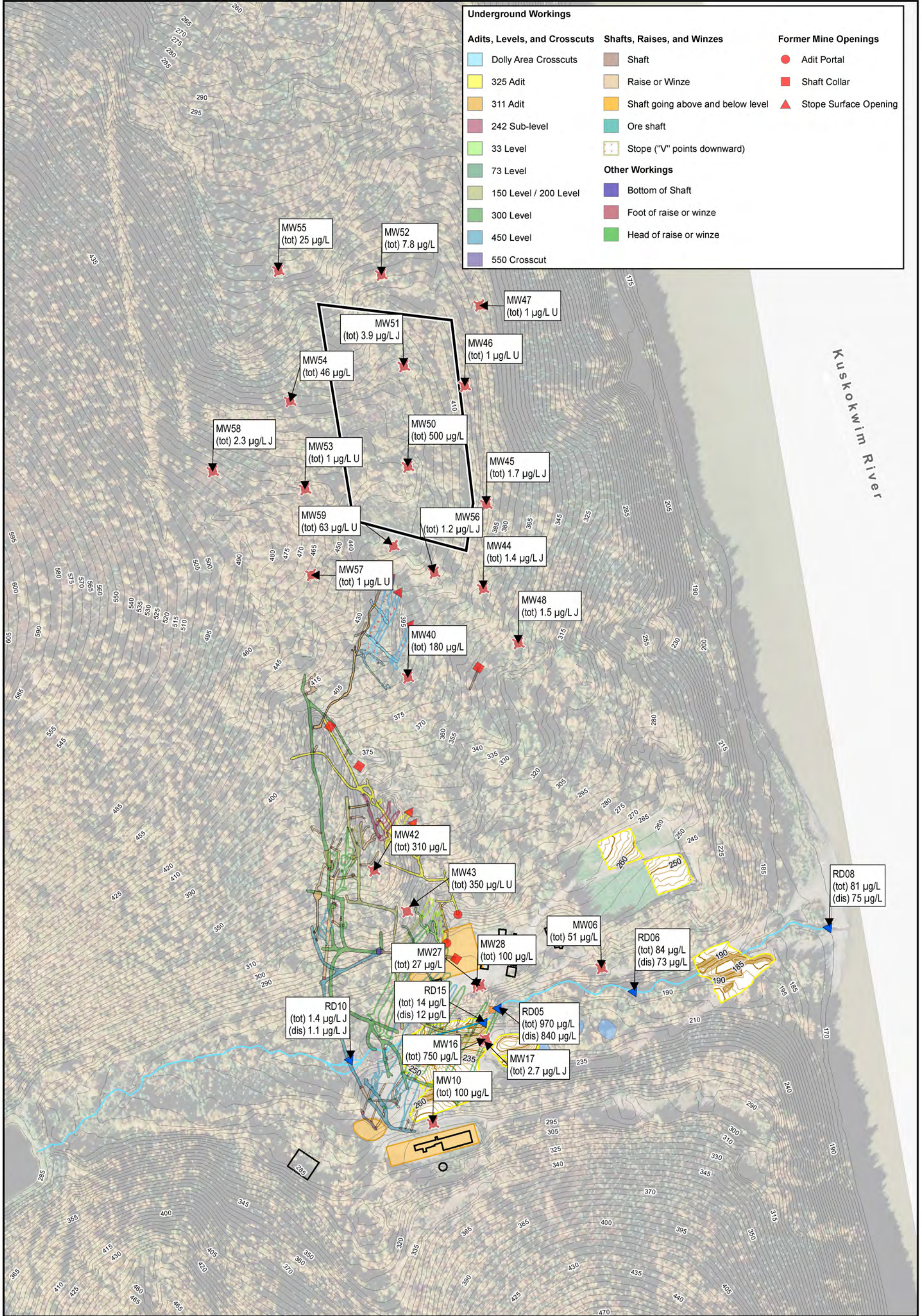
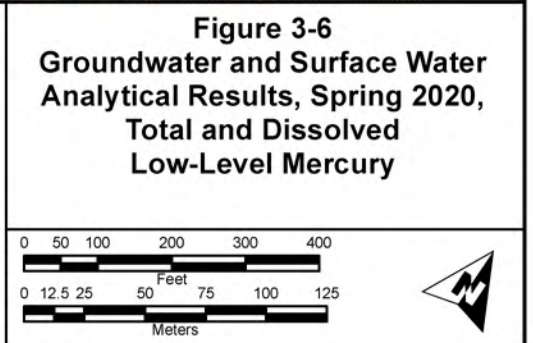
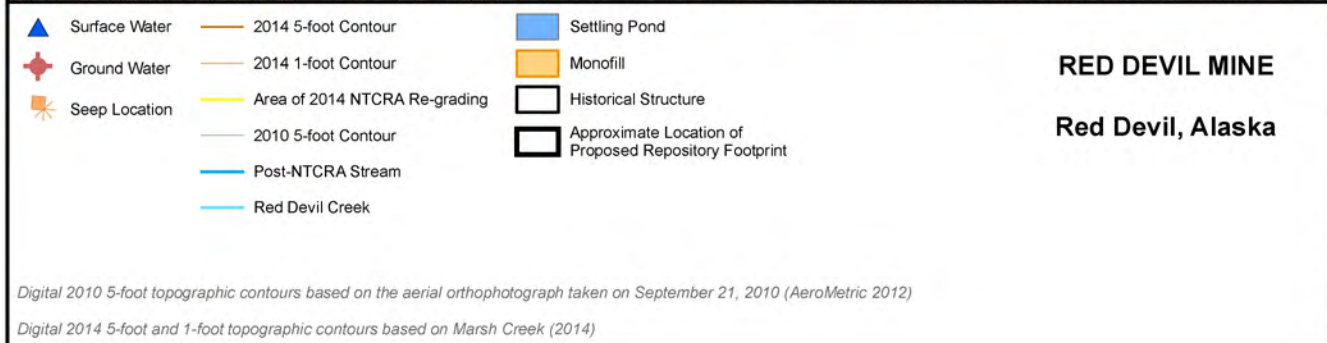
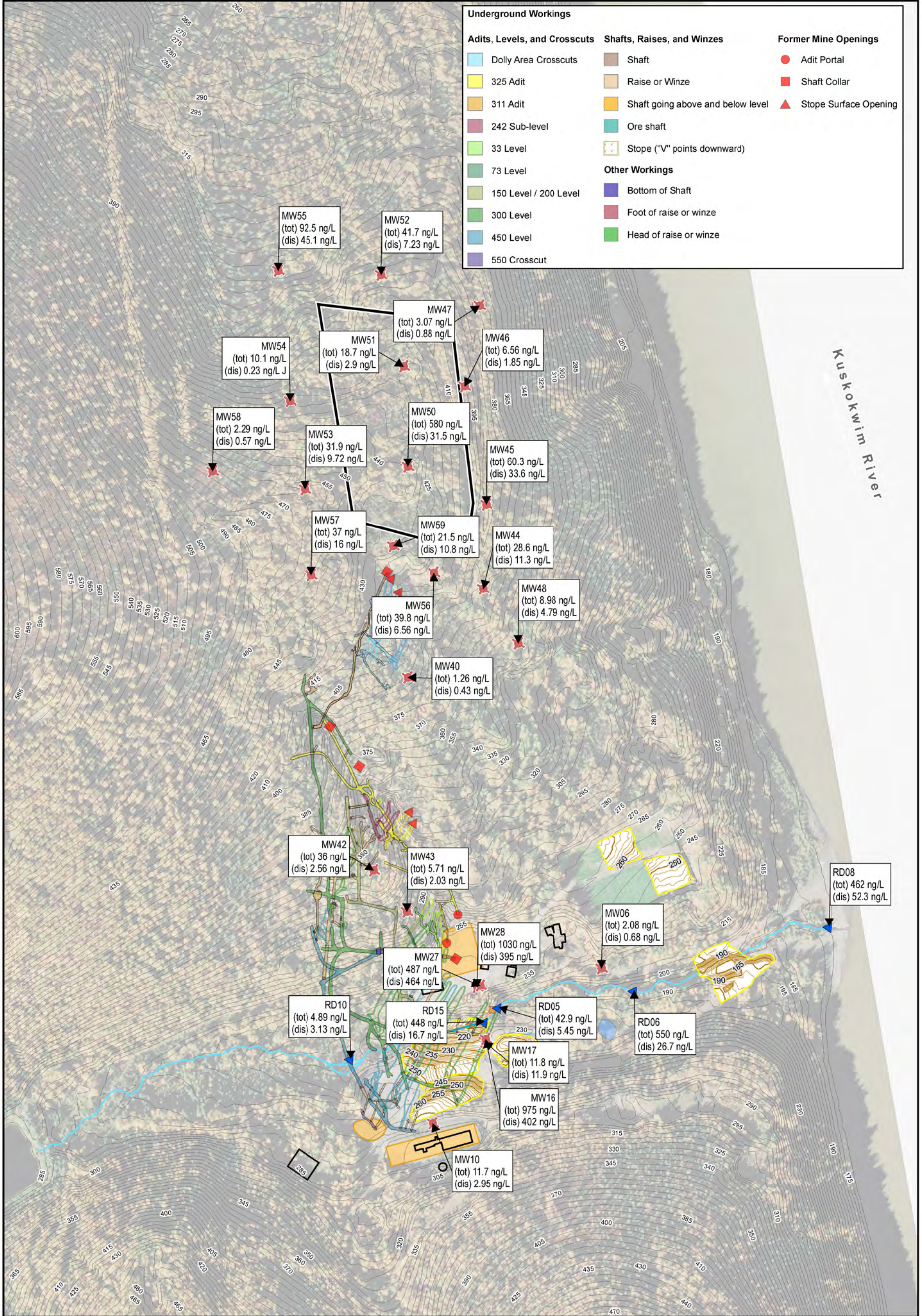


Figure 3-3 Continuous Groundwater Levels in Selected Wells - Fall 2017 to Fall 2020

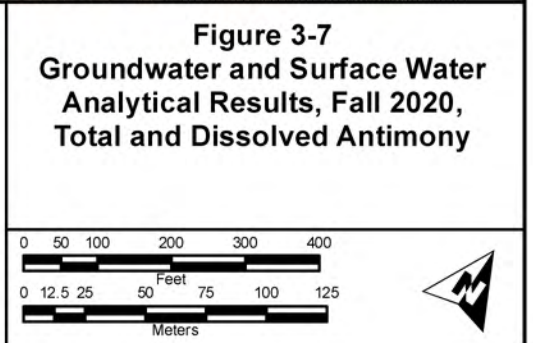
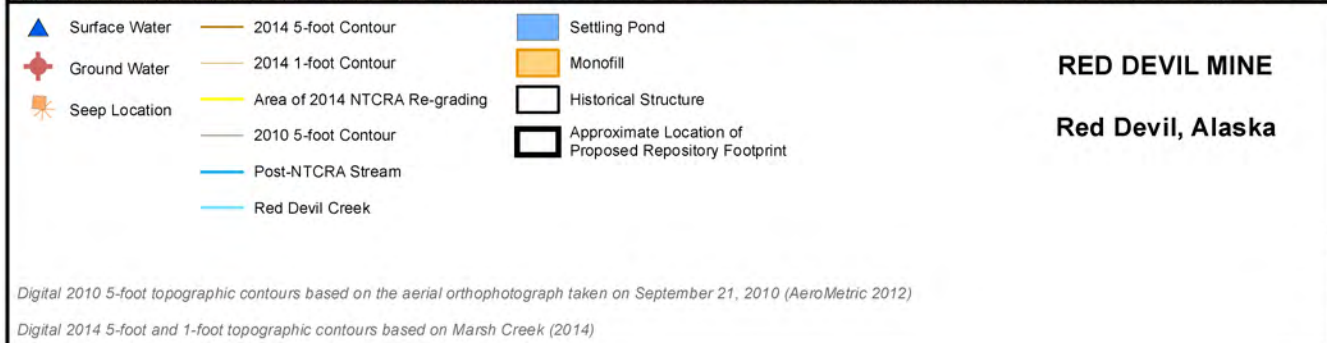
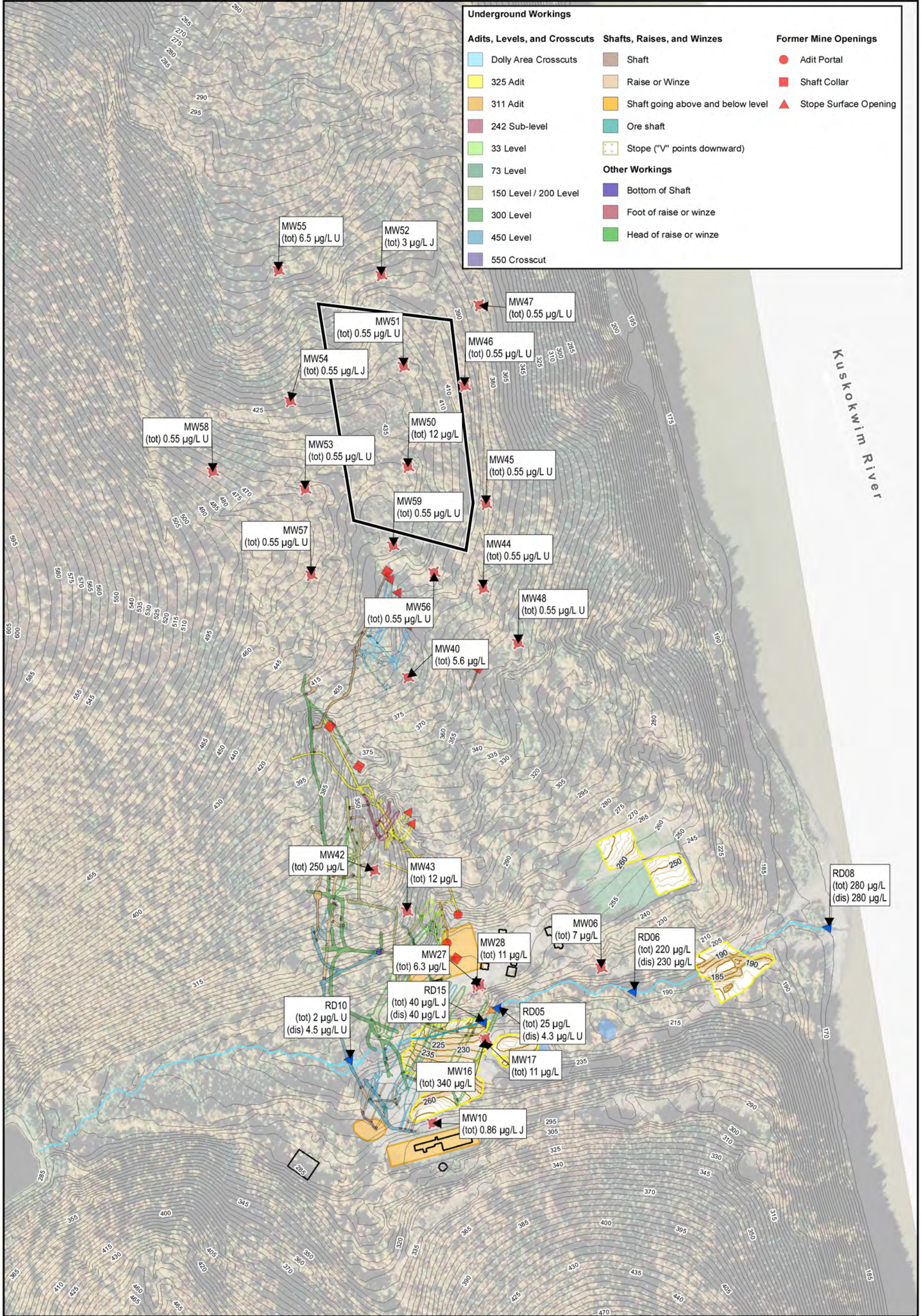


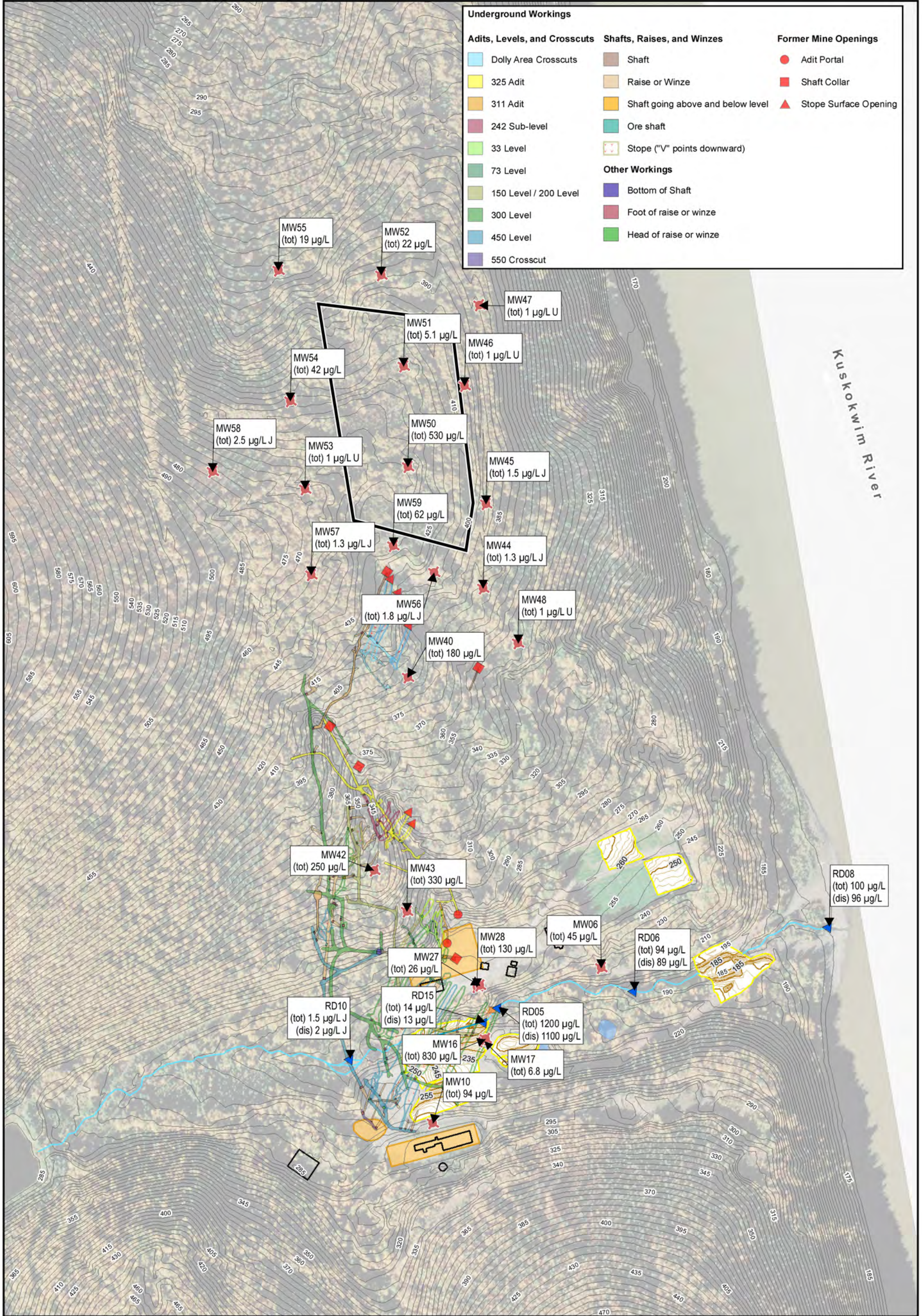






Digital 2010 5-foot topographic contours based on the aerial orthophotograph taken on September 21, 2010 (AeroMetric 2012)
Digital 2014 5-foot and 1-foot topographic contours based on Marsh Creek (2014)





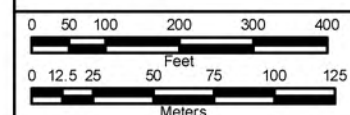
Underground Workings

Adits, Levels, and Crosscuts	Shafts, Raises, and Winzes	Former Mine Openings
Dolly Area Crosscuts	Shaft	Adit Portal
325 Adit	Raise or Winze	Shaft Collar
311 Adit	Shaft going above and below level	Stope Surface Opening
242 Sub-level	Ore shaft	
33 Level	Stope ("V" points downward)	
73 Level		
150 Level / 200 Level	Bottom of Shaft	
300 Level	Foot of raise or winze	
450 Level	Head of raise or winze	
550 Crosscut		

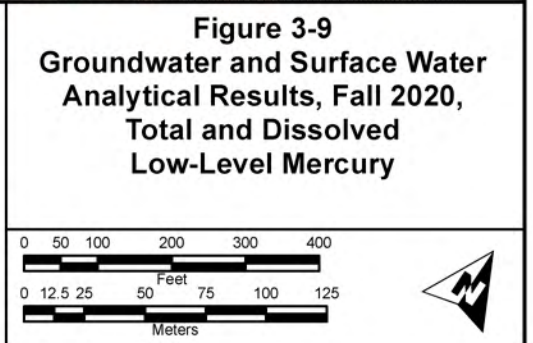
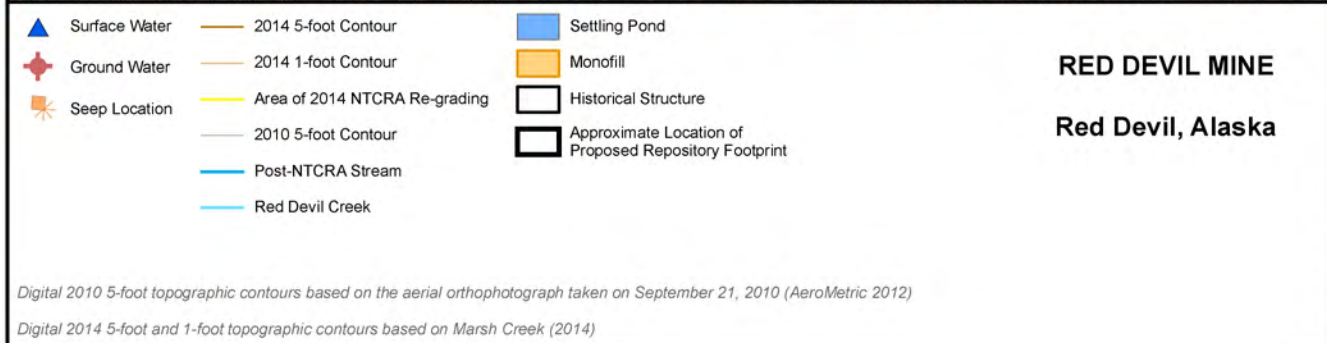
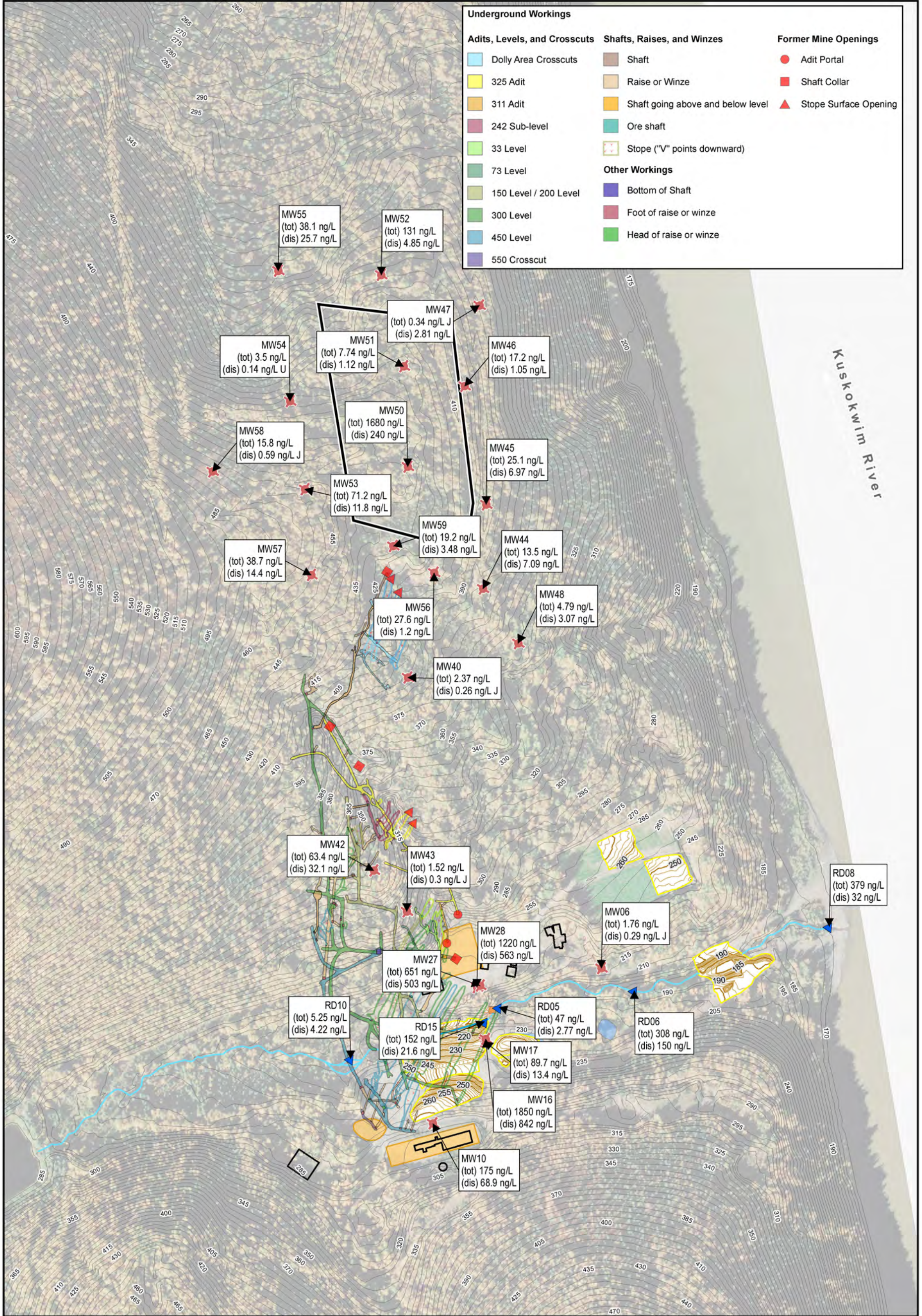
Surface Water	2014 5-foot Contour	Settling Pond
Ground Water	2014 1-foot Contour	Monofill
Seep Location	Area of 2014 NTCRA Re-grading	Historical Structure
	2010 5-foot Contour	Approximate Location of Proposed Repository Footprint
	Post-NTCRA Stream Alignment	
	Red Devil Creek	

RED DEVIL MINE
Red Devil, Alaska

Figure 3-8
Groundwater and Surface Water Analytical Results, Fall 2020, Total and Dissolved Arsenic



Digital 2010 5-foot topographic contours based on the aerial orthophotograph taken on September 21, 2010 (AeroMetric 2012)
Digital 2014 5-foot and 1-foot topographic contours based on Marsh Creek (2014)



Digital 2010 5-foot topographic contours based on the aerial orthophotograph taken on September 21, 2010 (AeroMetric 2012)
Digital 2014 5-foot and 1-foot topographic contours based on Marsh Creek (2014)

4

Conclusions and Recommendations

4.1 Groundwater

Groundwater monitoring results from 2020 baseline monitoring events are generally consistent with the results of previous investigations at the RDM, as described in the *Final Red Devil Mine Groundwater and Surface Water Report* (E & E 2019b).

Groundwater elevation results from the spring and fall 2020 baseline monitoring events support the existing understanding of groundwater flow in the MPA, surface mined area (SMA) and upland areas of the site. Groundwater in the vicinity of the MPA generally mimics topography and flows toward Red Devil Creek. However, within the SMA, mine workings affect groundwater depth and gradient near the mine workings. The mine workings provide a highly transmissive hydraulic connection that depresses the water table in those areas and establishes a hydraulic gradient toward the collapsed mine workings. The groundwater elevation results indicate a preferential flow pathway in the vicinity of the mine workings through the center of the SMA toward Red Devil Creek.

Continuous groundwater elevation data from the 2020 baseline monitoring events (presented in Figure 3-3) build on previous understanding of temporal trends in groundwater elevations at the RDM. In late spring, groundwater elevations quickly rise to a peak level corresponding with maximum snowmelt, followed by a period of generally decreasing water levels during the summer punctuated by occasional rises in water levels likely attributable to rain events. Water levels decrease during the winter with freezing conditions. Water levels at monitoring wells used to measure continuous groundwater elevations in the SMA varied seasonally by between approximately 10 to 35 feet.

Concentrations of primary contaminants of concern (COCs)—antimony, arsenic, and mercury—in groundwater samples from the 2020 baseline monitoring events follow expected trends in spatial distribution, based on previous sampling. In general, the highest concentrations of COCs are found where tailings/waste rock lie below the water table, including the MPA and parts of the Red Devil Creek valley downstream alluvial area, with generally lower concentrations found in areas of the SMA that are not influenced by natural mineralization. Concentrations of COCs in groundwater at the RDM do not exhibit obvious temporal trends.

4 Conclusions and Recommendations

Graphs of groundwater COC concentrations and static water levels for selected wells from spring 2010 through fall 2020 are presented in Figure 4-1.

4.2 Surface Water

Surface water monitoring results from 2020 baseline monitoring events are generally consistent with the results of previous investigations at the RDM, as described in the *Final Red Devil Mine Groundwater and Surface Water Report* (E & E 2019b). Estimated surface water discharge in spring 2020 ranged from 0.17 at the seep to 1.28 cubic feet per second (cfs) at station RD08 near the Red Devil Creek delta. The creek generally appeared to be gaining over most of its length below RD10. This observation is consistent with previous characterization of baseflow conditions in Red Devil Creek, described in section 3.2.2 of the 2014 RI (E & E, 2014). Discharge in fall 2020 was relatively low, with Red Devil Creek discharge ranging from 0.39 to 0.44 cfs. The creek generally appeared to be gaining over most of its length below RD10.

Trends in surface water concentrations of COCs at the RDM are influenced by interaction between groundwater and surface water in Red Devil Creek. Groundwater emerges to surface water as Red Devil Creek baseflow and via the seep located adjacent to the creek in the MPA. Red Devil Creek is impacted primarily by emergence of groundwater into the stream along gaining reaches in the MPA. Concentrations of COCs increase longitudinally moving from upstream to downstream of the MPA along Red Devil Creek. A longitudinal plot of surface water concentrations in Red Devil Creek is presented as Figure 4-2.

4.3 Recommendations

Groundwater sampling and analysis has evolved over the course of this CERCLA project from characterization during the Remedial Investigation (RI) to baseline monitoring. Initial goals of groundwater sampling and analysis were consistent with the overall objectives of the RI and were focused primarily on the area along the lower reach of Red Devil Creek referred to as the MPA. Additional monitoring wells have been installed since the initial RI was completed that have broadened our understanding of flow within the bedrock aquifer in areas that are influenced by natural mineralization but are not affected by the tailings and waste rock. The BLM selected a preferred remedial action alternative in 2020 that involves consolidating tailings/waste rock in an engineered repository located in the SMA. Consequently, groundwater characterization emphasizing the area dominated by tailings (i.e., MPA) and a broad range of potential contaminants has transitioned to baseline monitoring focused on flow characteristics within the SMA and the MPA. Understanding groundwater flow upgradient of the existing tailings piles is critical to establishing a baseline condition in the MPA following remedial action. Therefore future baseline monitoring focus on the SMA, with a limited number of wells in the MPA.

Figure 4-1a. Groundwater Concentrations and Elevation - Upstream Alluvial Area

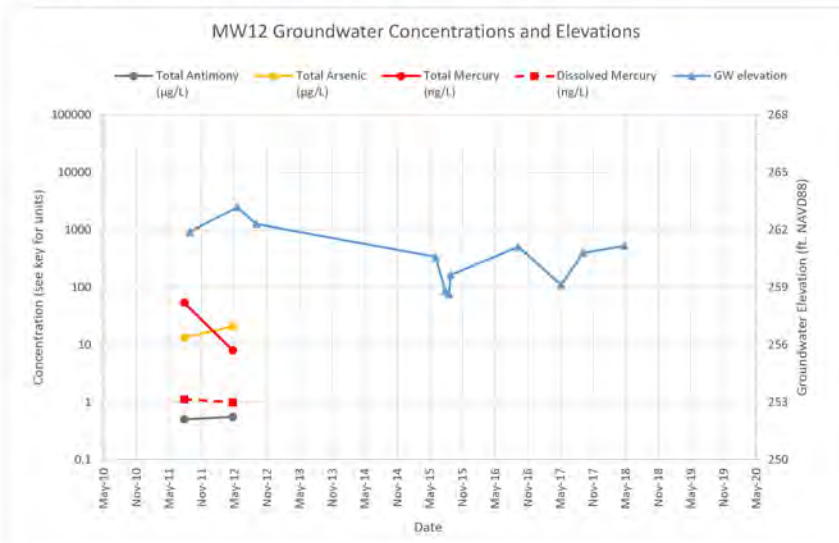


Figure 4-1b. Groundwater Concentrations and Elevation - Upland Area

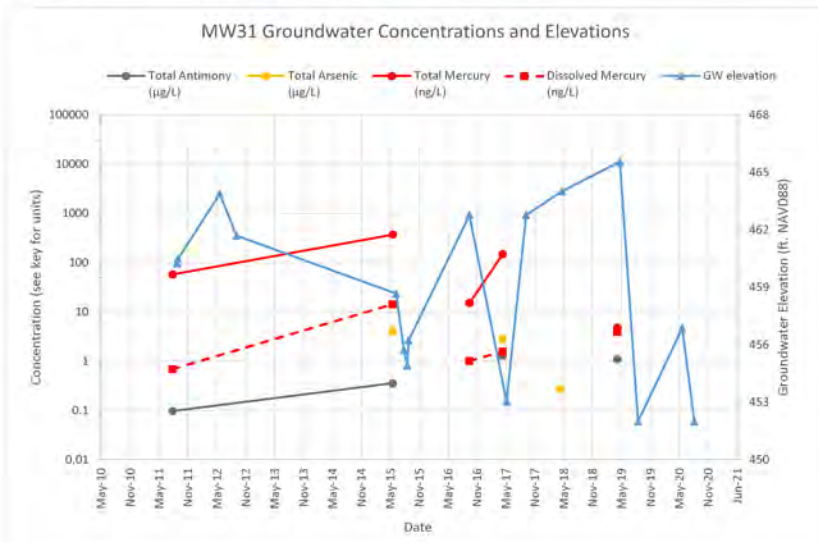


Figure 4-1c. Groundwater Concentrations and Elevation - Surface Mined Area
Page 1

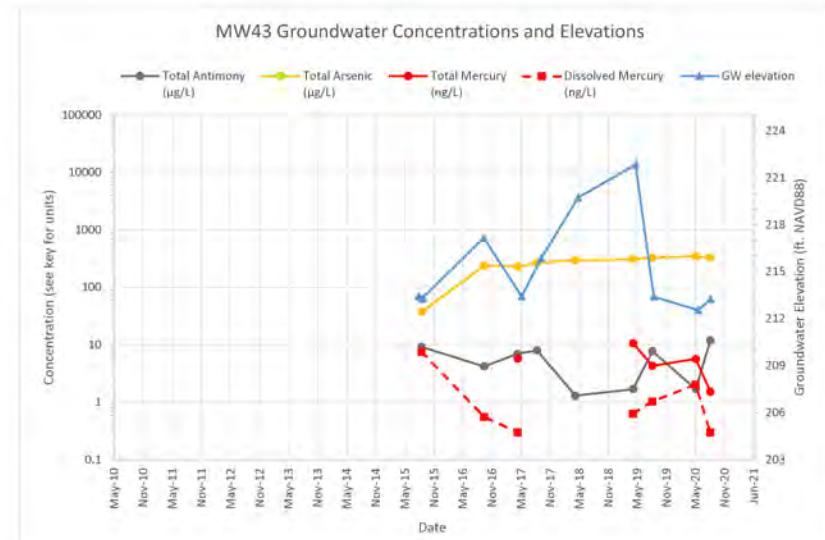
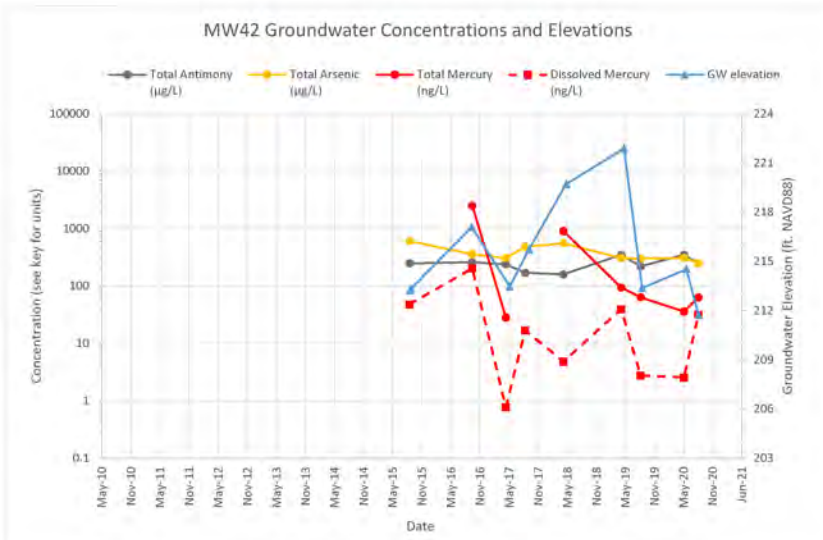
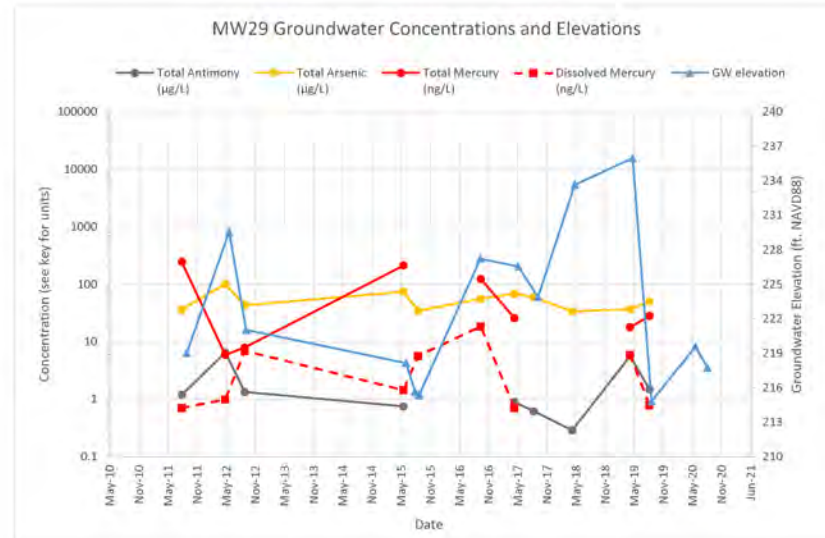
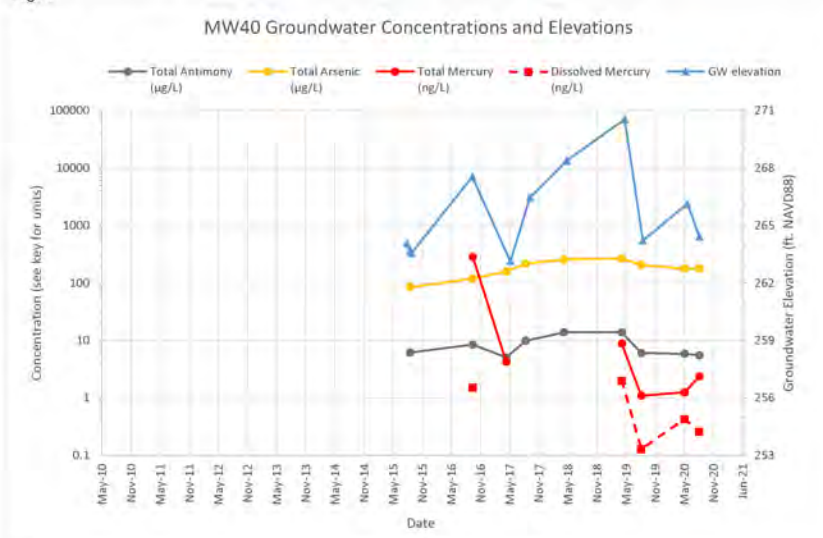


Figure 4-1c. Groundwater Concentrations and Elevation - Surface Mined Area
Page 2

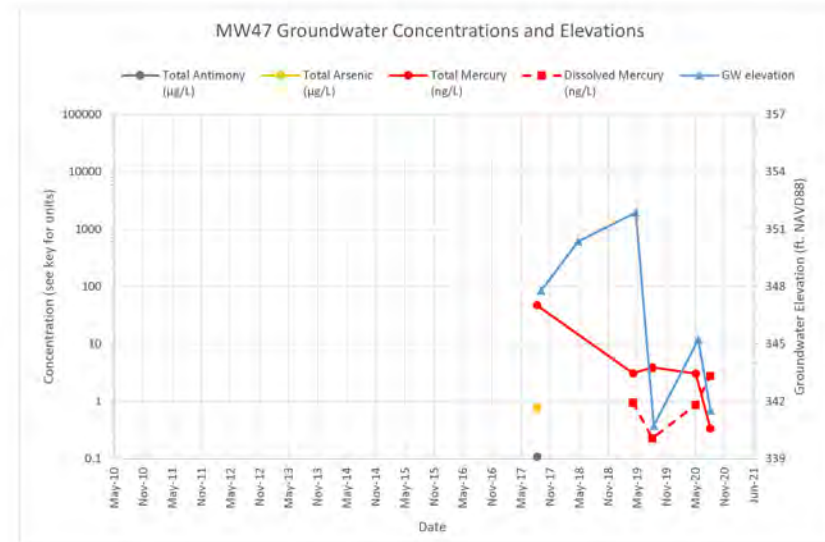
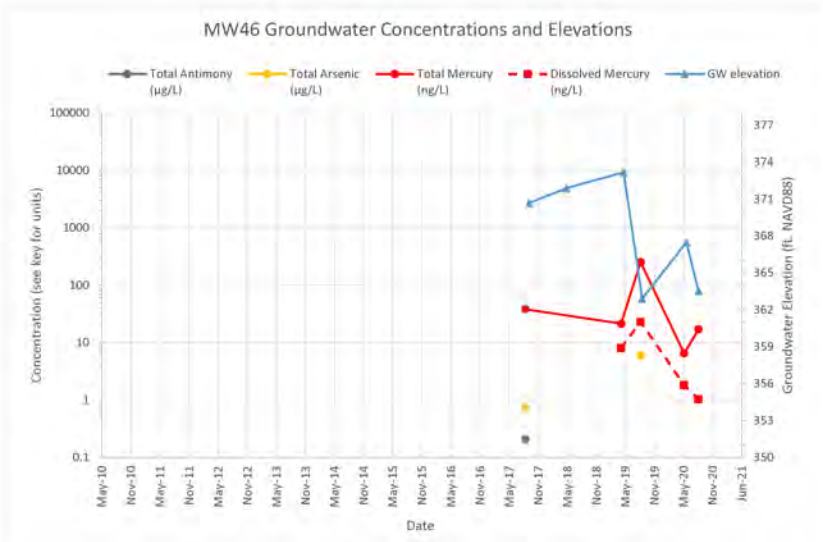
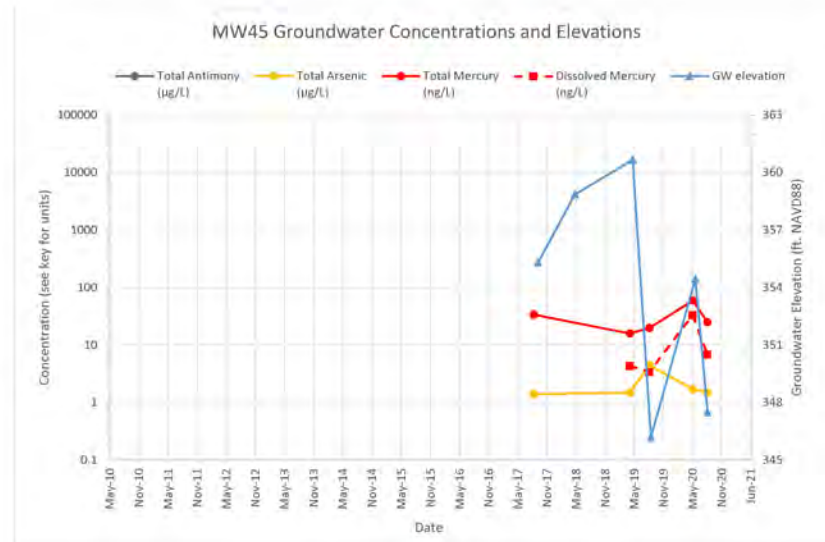
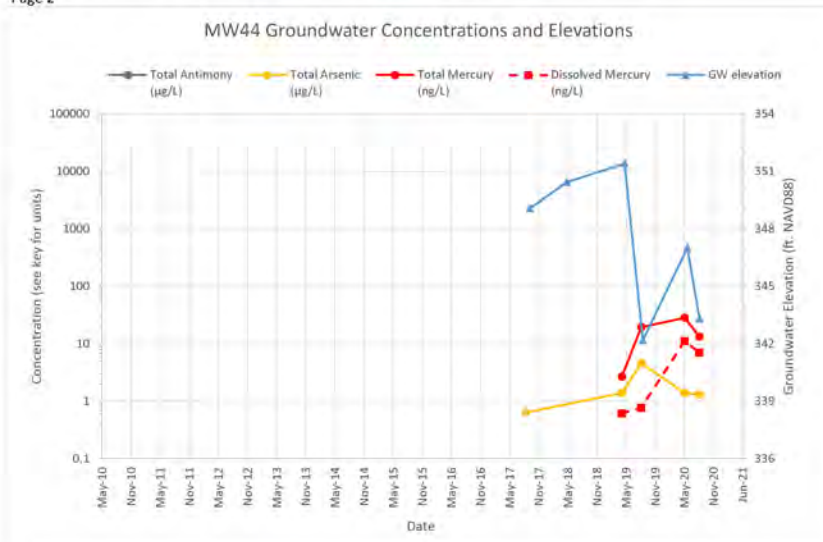


Figure 4-1c. Groundwater Concentrations and Elevation - Surface Mined Area
Page 3

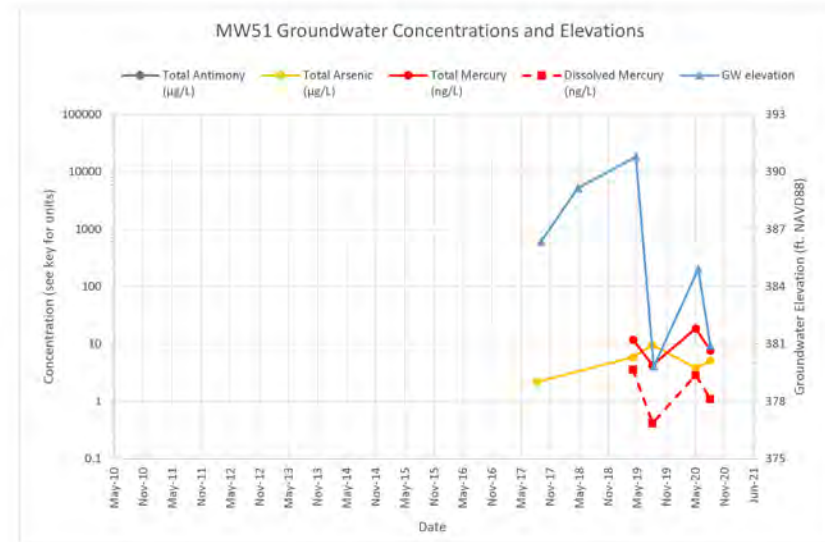
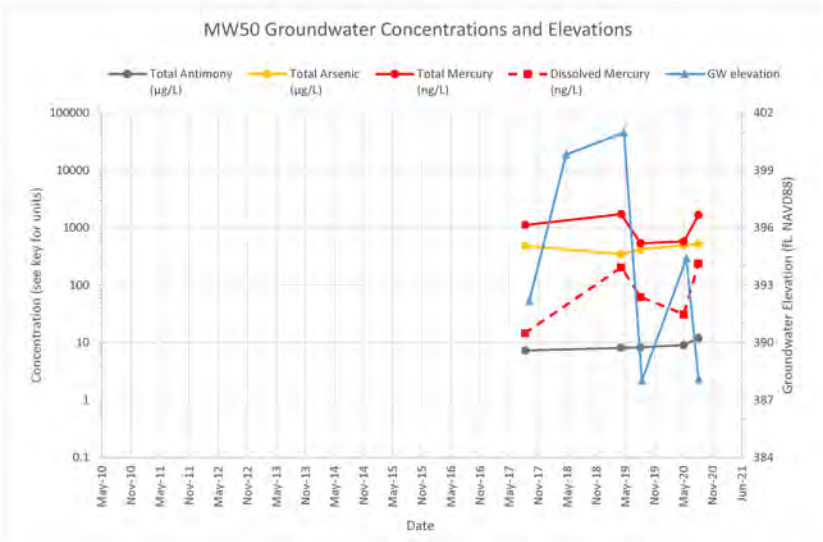
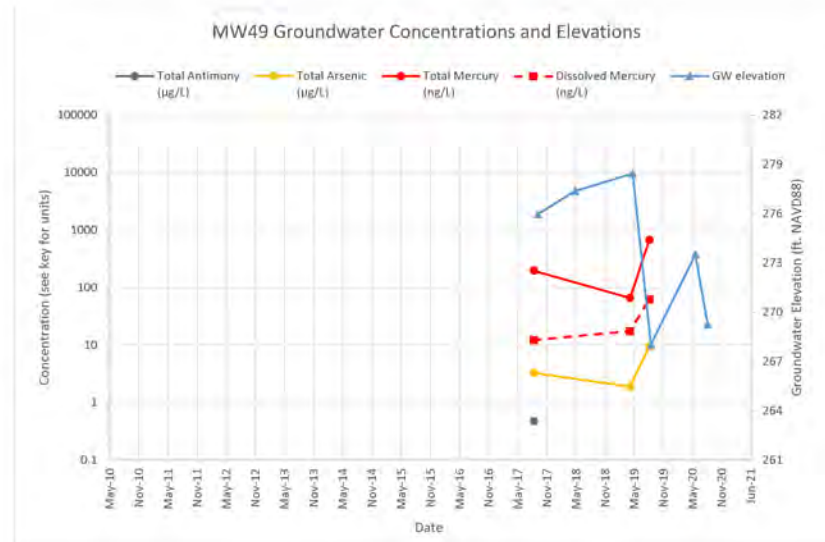
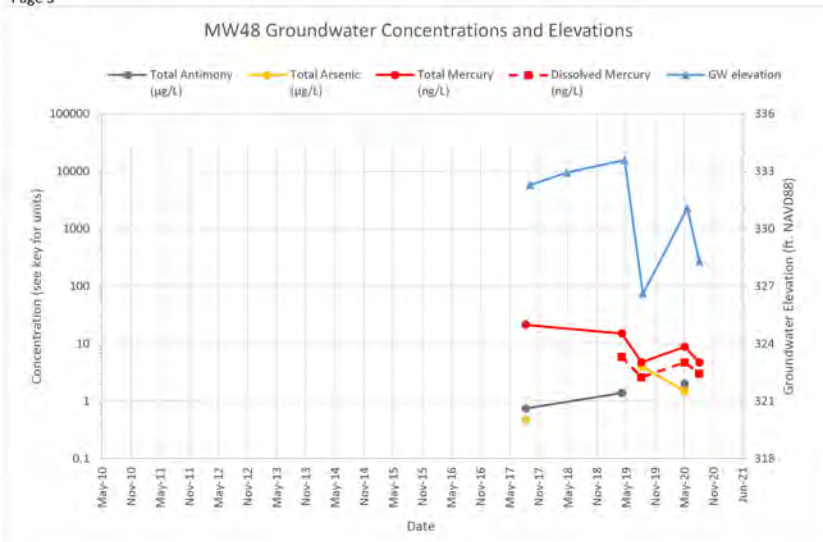


Figure 4-1c. Groundwater Concentrations and Elevation - Surface Mined Area
Page 4

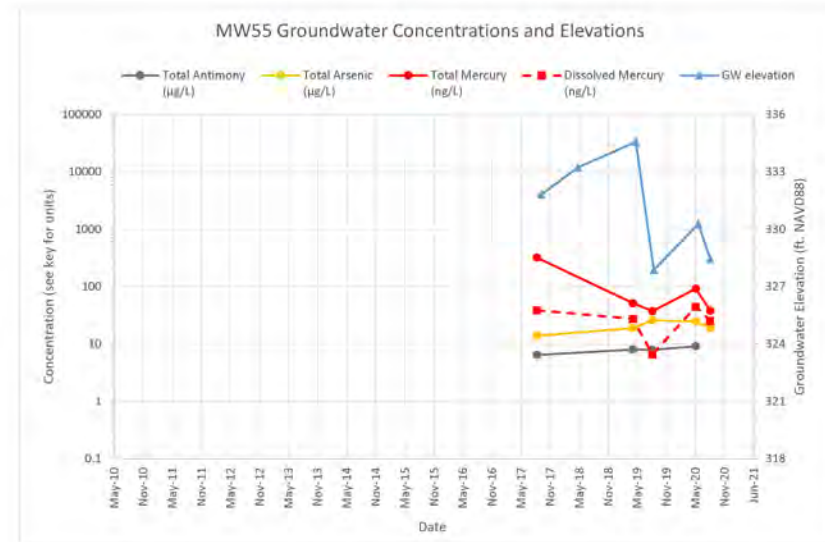
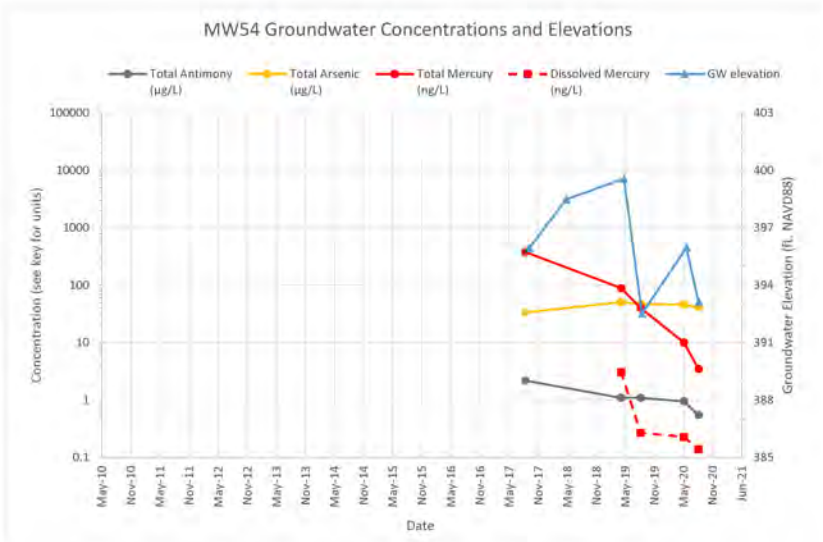
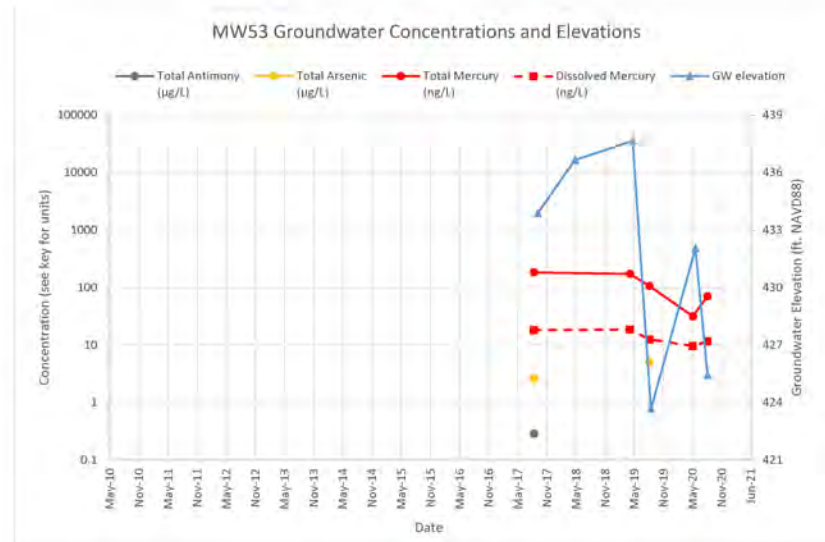
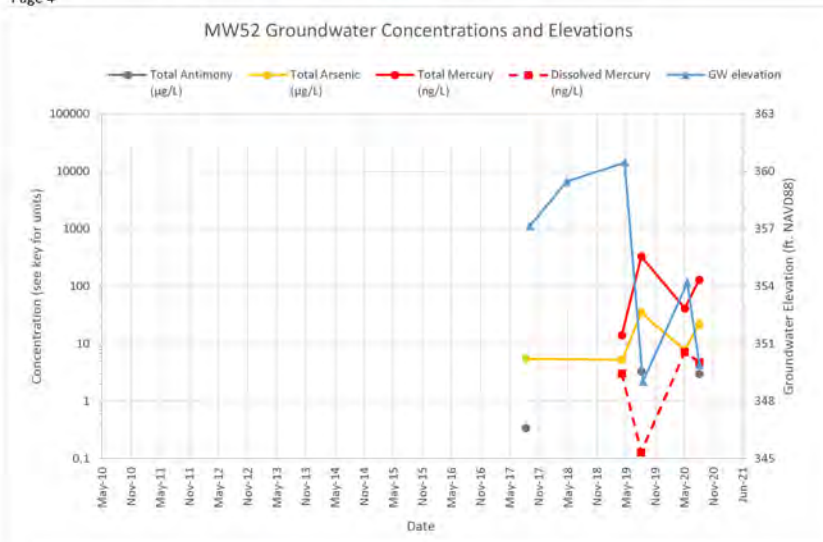


Figure 4-1c. Groundwater Concentrations and Elevation - Surface Mined Area
Page 5

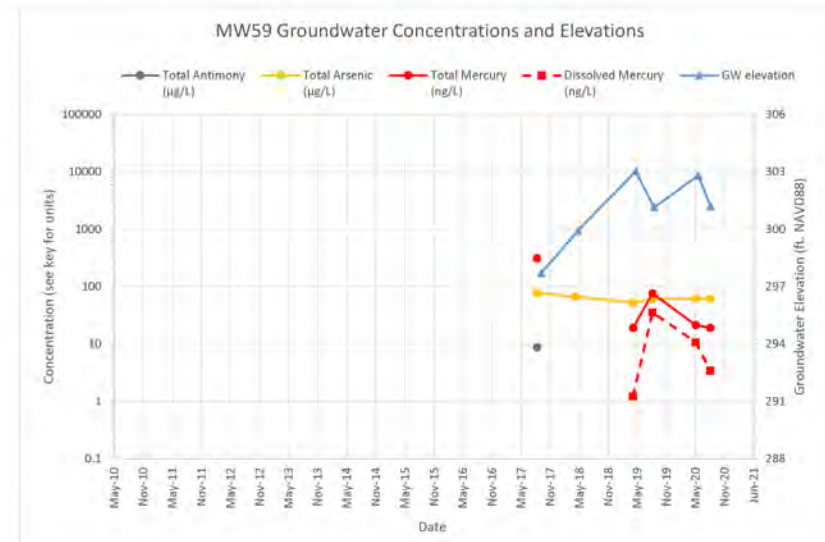
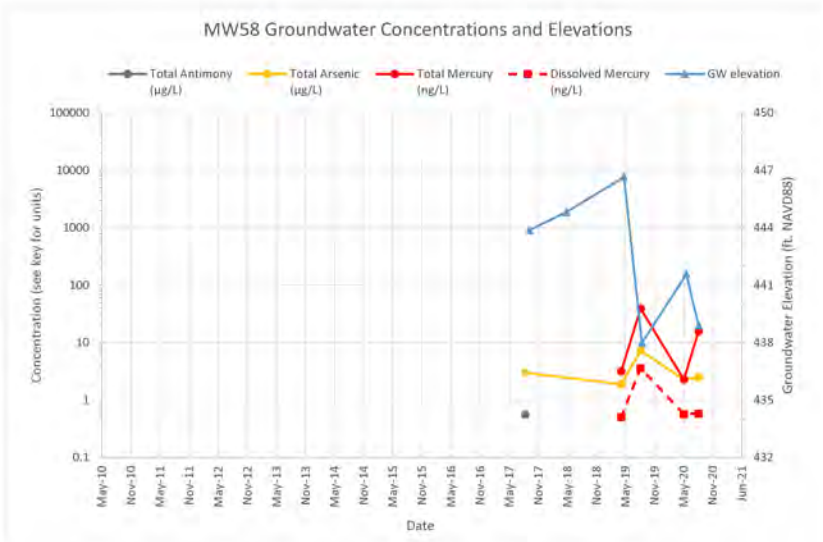
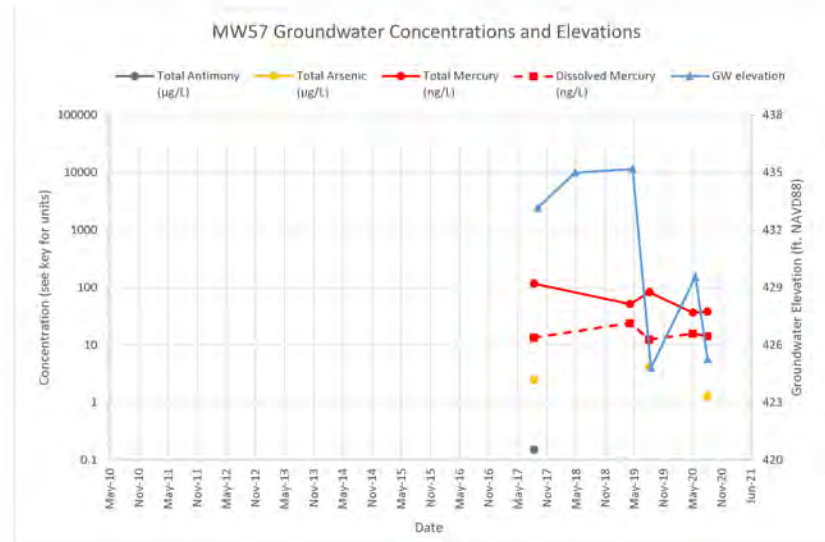
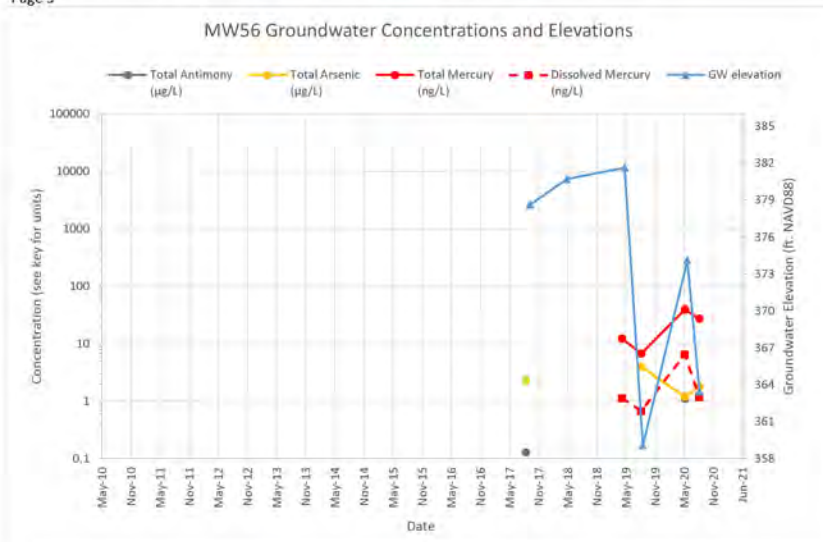


Figure 4-1d. Groundwater Concentrations and Elevation - Pre-1955 Main Processing Area

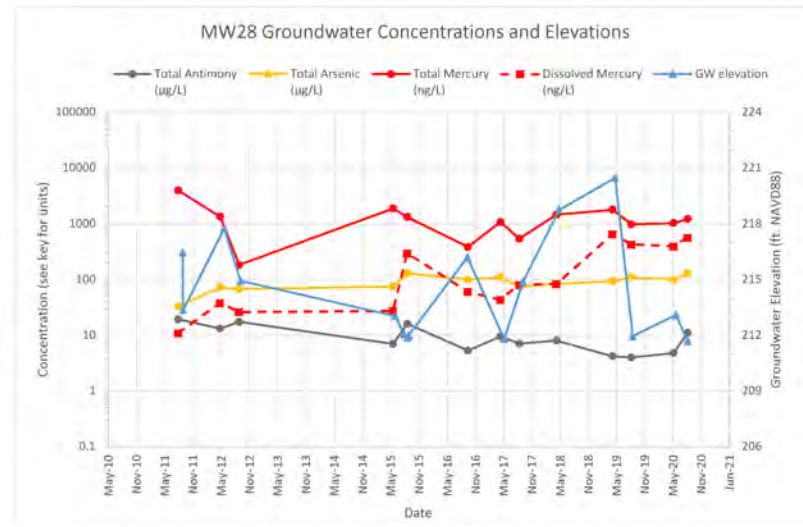
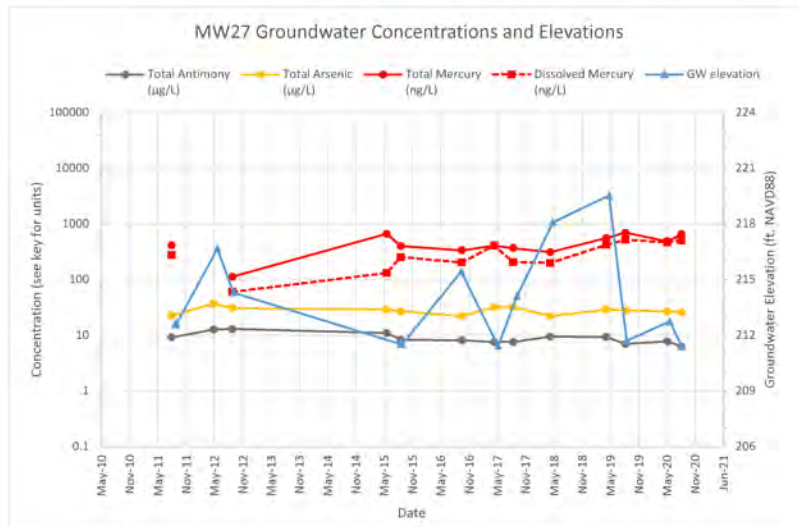
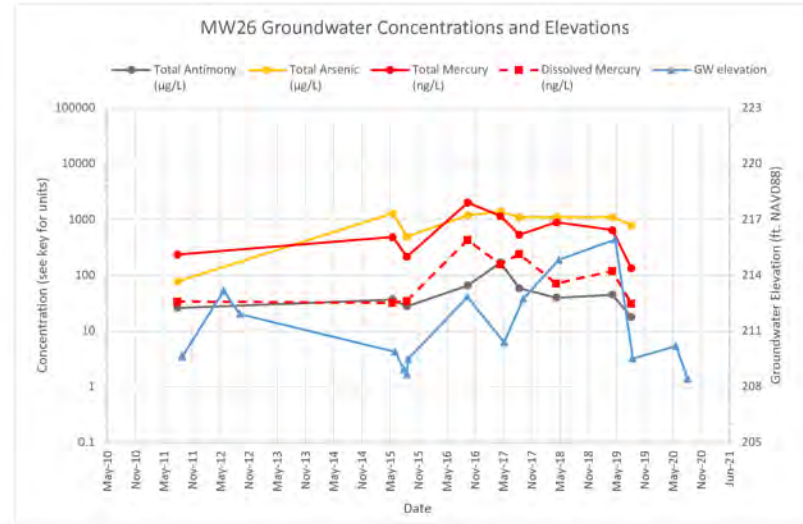
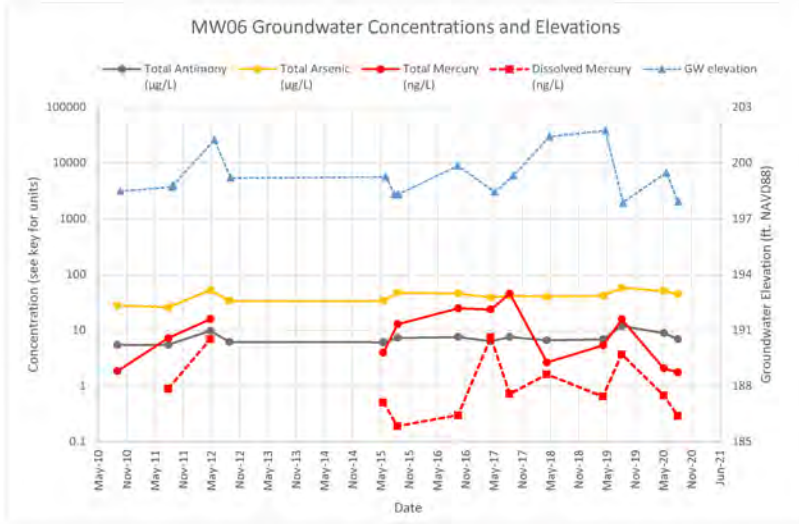


Figure 4-1e. Groundwater Concentrations and Elevation - Post-1955 Main Processing Area
Page 1

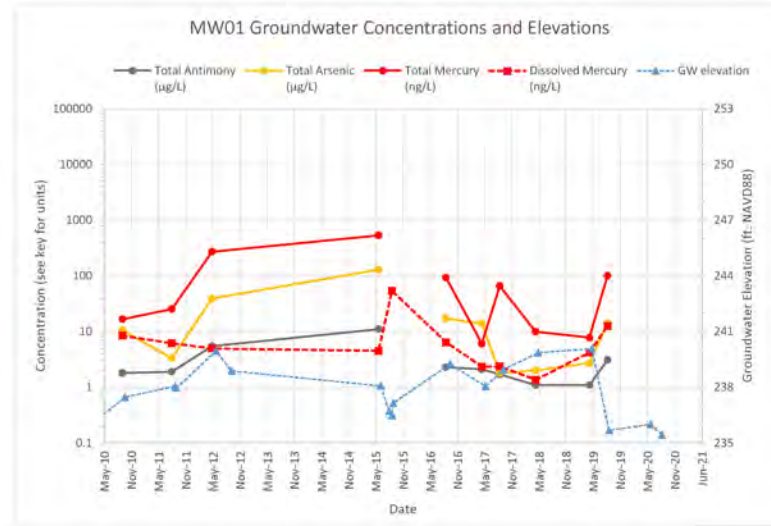
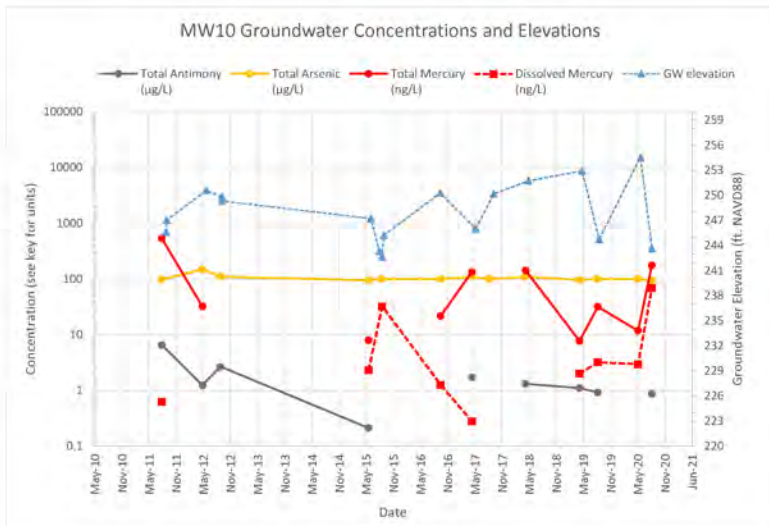
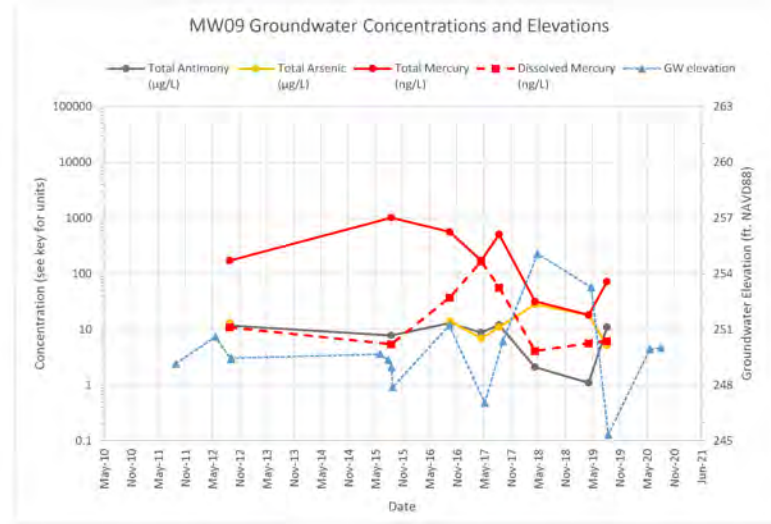
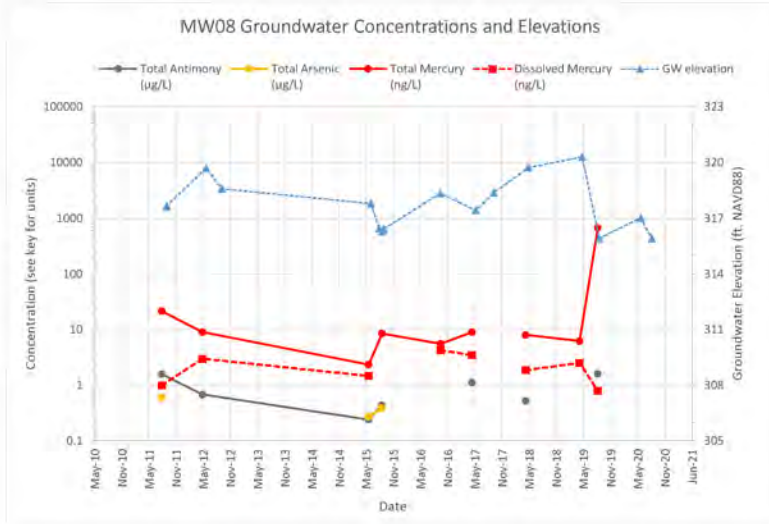


Figure 4-1e. Groundwater Concentrations and Elevation - Post-1955 Main Processing Area
Page 2

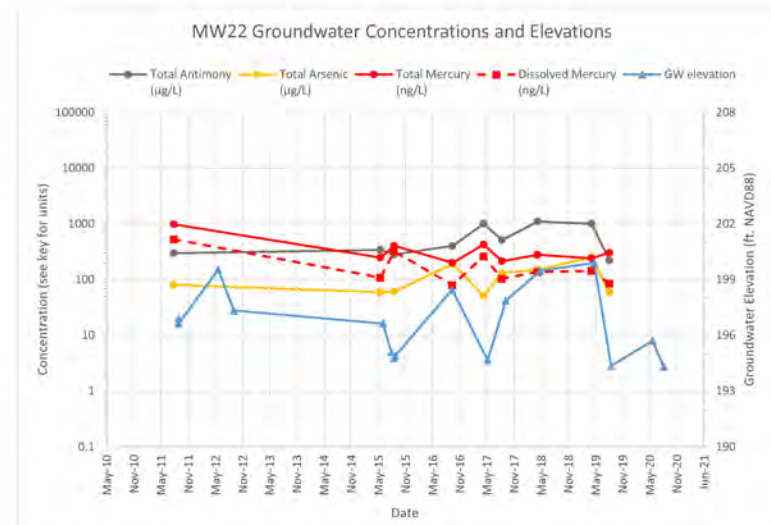
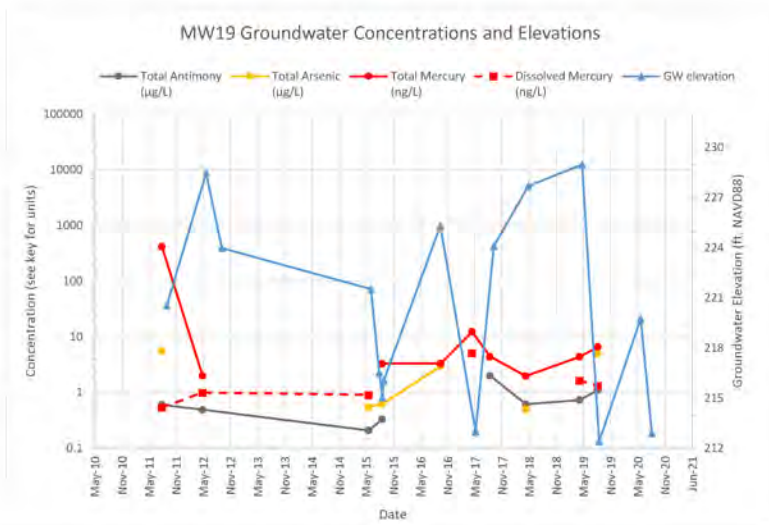
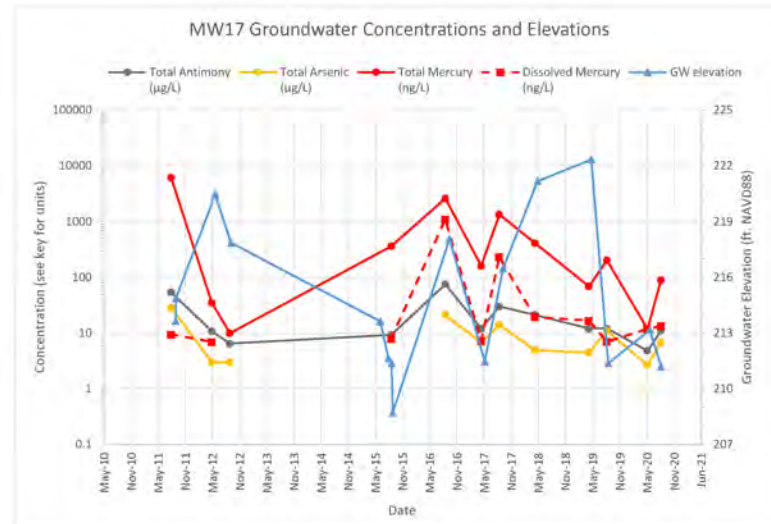
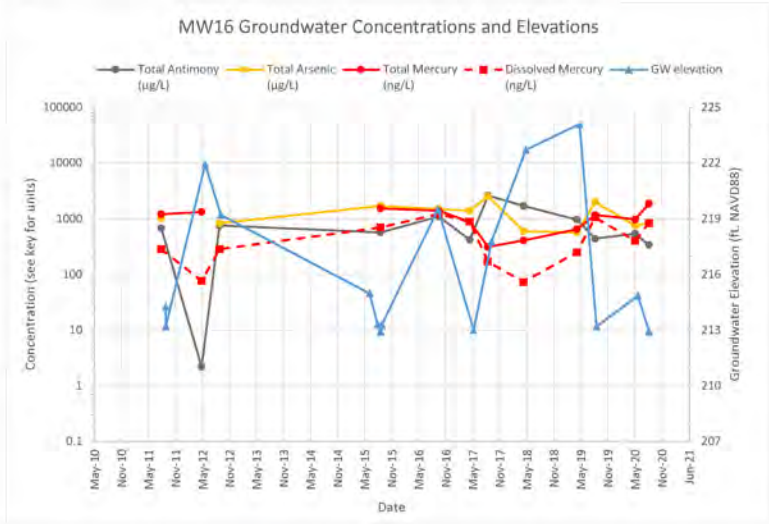


Figure 4-1f. Groundwater Concentrations and Elevation - Downstream Alluvial Area

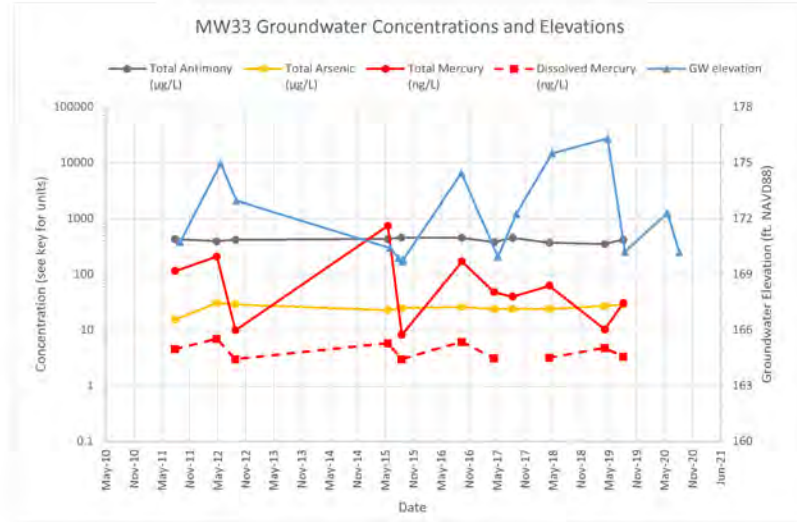
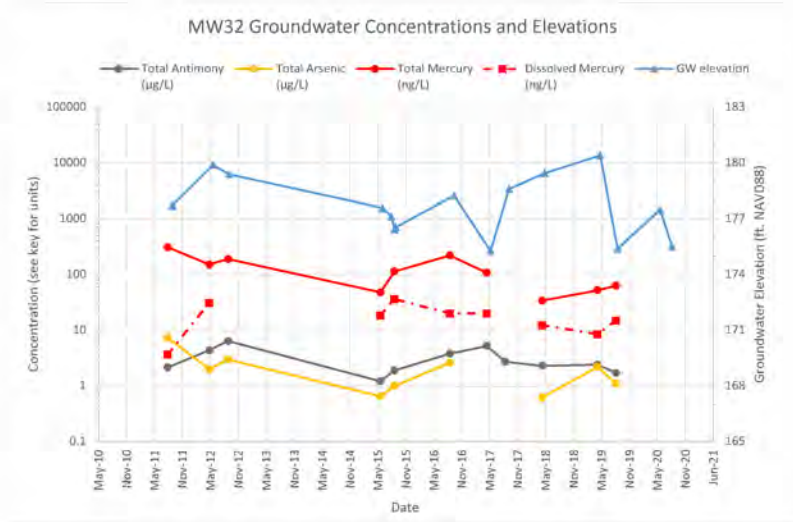
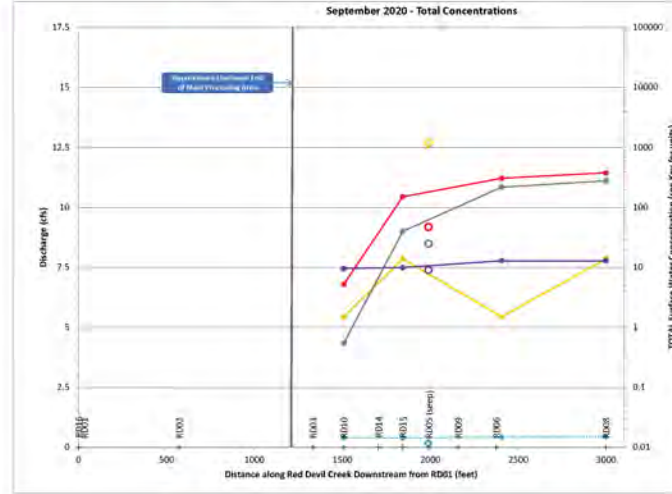
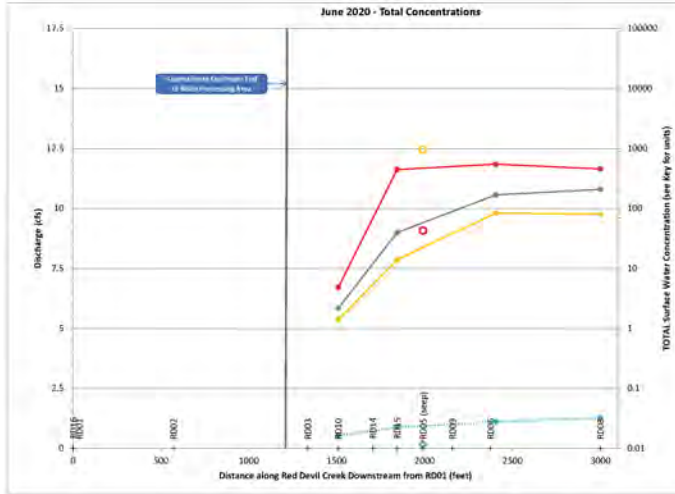


Figure 4-2 Red Devil Creek and Seep Surface Water Concentrations and Discharge, Spring & Fall 2020

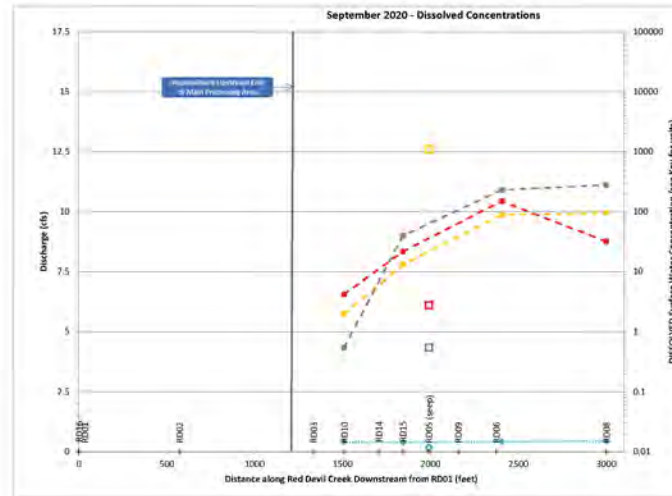
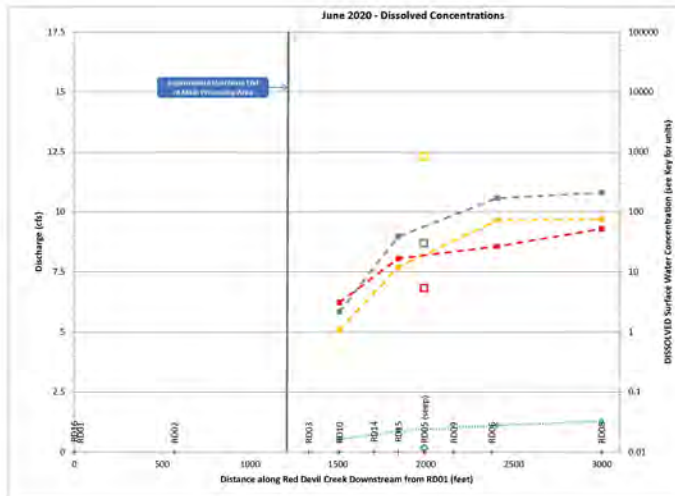
Legend:
 ● RDC Discharge
 ◆ Seep Discharge

— Total Arsenic (ug/l) ○ Seep Total Arsenic (ug/l)
 — Total Mercury (ng/l) ○ Seep Total Antimony (ug/l)
 — Total Antimony (ug/l) ○ Seep Total Mercury (ng/l)
 — Sulfate (mg/L) ○ Seep Total Sulfate (mg/L)



Legend:
 ● RDC Discharge
 ◆ Seep Discharge

— Dissolved Arsenic (ug/L) ○ Seep Dissolved Arsenic (ug/L)
 — Dissolved Mercury (ng/L) ○ Seep Dissolved Antimony (ug/L)
 — Dissolved Antimony (ug/L) ○ Seep Dissolved Mercury (ng/L)



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5

References

Ecology and Environment, Inc. (E & E). 2014. *Final Remedial Investigation Report Red Devil Mine, Alaska*. November.

_____. 2019a. *Final Work Plan, Groundwater and Surface Water Baseline Monitoring, Red Devil Mine, Alaska*. May.

_____. 2019b. *Final Red Devil Mine Groundwater and Surface Water Report, Red Devil, Alaska*. August.

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A

Photolog

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Red Devil Mine



Date: 6/16/2020
Direction: NW
Description: Tension cracks along service road to RDM.

Photo Log (Project #1001095.0026.06)



Date: 6/23/2020
Direction: NE
Description: Damaged gabions as part of drainage and NTCRA.



Date: 6/23/2020
Description: View downstream from end of NTCRA spliced section.
Direction: NE



Date: 9/9/2020
Direction: NE
Description: View of repairs made to damaged gabions.

Red Devil Mine



Date: 9/3/2020
Direction: Down
Description: Dedicated well cap installed in MW10.

Photo Log (Project #1001095.0026.06)



Date: 6/23/2020
Direction: SW
Description: Damaged ropes and sandbags located on monofill.

WSP

B

Field Logbook

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RDM Baseline F19, S20, F20

T1



Rite in the Rain[®]
ALL-WEATHER
**ENVIRONMENTAL
FIELD BOOK**

No 550

RDM Baseline
Monitoring

Fall 2019

TEAM 1

Spring 2020

Fall 2020



2019 Fall Baseline

- level and will pump very slow. Therefore
mws will be sampled instead
- 1445 MW48 water level: 24.03ft
- 1516 Collect 0919 MW48 GW with
duplicate 0919 MW102 GW at ~ 70ml/min
(clean hands, dirty hands for low
level htg.)
- 1615 Complete at MW48. Demob and
move to MW19
- 1625 Arrive at MW19, water level: 26.97ft
- 1640 Begin purging MW19
- 1755 Collect 0919 MW19 GW at ~ 70ml/min
Collected all organics (BTEX/LPO, DRO
and SVOCs)
- 2000 Demob from MW19
- 2020 Depart for lodge
- 2045 Arrive at lodge, End of day

J. P. [Signature]

2020 Spring Baseline

- 0600 C Billor, M Talaia Murray &
C Escoda depart SEA → ANC
- 0830 B Alexander depart PDX → ANC
- 1100 A Happel depart MKE → ANC
- 0830 (late entry) - C Billor, C Escoda &
M Talaia Murray arrive in
ANC & complete supply runs
- 1300 B Alexander arrive ANC
- 1545 Depart ANC → RDV w/
C Billor, M Talaia-Murray,
C Escoda & B Alexander.
- 1700 Arrive RDV, unload supplies
& prepare for tomorrow's tasks.
- 1730 A Happel arrive ANC, she
will depart ANC → RDV @
1300 tomorrow.
- 2000 End day for team in RDV →

6/15 C Billor

Location Red Devil Mine Date 6/16/20Project / Client 1001095.0026.052020 Spring Baseline

0835 CB, MTM, BA, CE muster for H₂S mtg, discuss emergency cons & evac plan. Weather, partly sunny 50s-60s °F. Today's plan
 BA, CE - prepare bottle kits
 AH - finish shopping in ANC & depart to RDV @ 1300
 CB, MTM - Decon pump barbs & bushings
 collect rinsate blank
 Go to site for install of deconed barbs & bushings & replace damaged tubing

1100 - Begin decon procedure for replacement barbs:

- ① Alconox soln: Placed barbs in a 1L sample bottle & agitated w/ alconox soln. Drain alconox soln, & rinse w/ distilled
- ② DI rinse: Placed barbs in a container w/ Type II DI, rinse

1130 - Collect rinsate blank [RBO1]:

- ③ Transfer cleaned, rinsed barbs to a clean 1L sample bottle that has been triple rinsed w/ BAL DI water.

Location Red Devil Mine Date 6/16/20 31Project / Client 1001095.0026.052020 Spring Baseline

1130 (cont'd) ④ Fill 1L container (w/ barbs) with BAL DI water. From this cont. collect aliquots for TSS, ALK, Nitrates, TAL ^{metals} and then, using CH/DH, Total LL Hg.

1130 Collect field blank [FBO1] at lodge

1305 CB & MTM depart lodge for site

1330 Photograph NTCRA repairs

1345 Arrive at MW56[Ⓟ] for bushing/barb replacement & tubing repair

1400 Since MW56 only needs tubing, and airline is still en route decide to start at MW57 for barb replace

1500 After attempting to remove the bushing. Determine that we need a larger wrench. Bagged up the pump to complete at lodge. See late entry re: transducer

1515 Head to MW43 to inspect tubing and replace if needed.

1530 Pull tubing @ MW43, no signs of freeze damage, but kinked @ pump. Repair (cut) kinked section

Location Red Devil Mine Date 6/16/20Project / Client 1001095.0026.052020 Spring Baseline

1530 (cont'd) and redeploy. Clean tubing for MW43 can be used for other wells if needed.

1630 Return to Lodge $\frac{1}{2}$ replace bushing on ~~MW43~~ ^{MW57} pump

1730 A Happel arrive RDV

1800 Head back to RDM (CB + MTM)

1835 Redeploy MW43 ⁵⁷ pump
dtw = 34.12 in MW ~~43~~ ⁵⁷ (CB)

1912 (late entry) Pulled Levellogger serial # 0042067275 from MW57

1900 Completed redeploy of MW57 pump at original inlet/depth

1924 Pulled Levellogger # 042077947 from MW58, dtw = 30.92

2000 Close MW58 after deploying pump to original inlet depth

2018 Pull Levellogger # 0042077952 (E) from MW54, dtw = 29.70

2050 Close MW54 after deploying pump to original inlet depth

2100 Replace barb at MW46 $\frac{1}{2}$ deploy to original depth

2145 Depart site for lodge (MTM, CB)

2215 End day

CB Miller 6/16/20

Location Red Devil Mine Date 6/17/20Project / Client 1001095.0026.052020 Spring Baseline

0845 CB, MTM, BA, CE $\frac{1}{2}$ Att muster for H $\frac{1}{2}$ S meeting, re: ATV safety. Weather: cloudy, 90°F, 30% rain
Today's plan: MTM, CE, $\frac{1}{2}$ Att will conduct SW sampling.

CB $\frac{1}{2}$ BA will conduct GW snapshot and complete bushing replacement on remaining pumps.

1115 CB, BA to site to assist w/ sampling $\frac{1}{2}$ flow meas. @ RDOB

1255 CB $\frac{1}{2}$ BA begin GW snapshot
See GW snapshot form

1430 Snapshot at MW10, ^{pull pump} open well to replace barb. Inspected tubing and removed one short kinked section near pump. Can retain 65' tubing section for other wells if needed. ^{Deploy @ original inlet}

1700 Replace barb at MW28, deployed pump to original inlet depth

1750 Replace barb at MW26, deployed pump to original inlet depth

1905 Replace barb at MW01, ^{deployed to original inlet}

2130 Depart site, arrive lodge @ 22:00 $\frac{1}{2}$ ends

CB Miller 6/17/20

34 Location Red Devil Mine Date 6/18/20

Project / Client 1001095, 0026.05

2020 Spring Baseline

0930 Muster for H₂S meeting, topics are Hydration/heat stress, wind/trees weather Partly cloudy, high 65°F, 30% rain Today's Plan

T1 & T2 sample MW 27, 28 then 42, 43 sample MW 16, 17 if time

1100 Gas up wheeler & depart for site

1145 Arrive site & set up on MW 28 measured top of pump = 58.04 btoc inlet = 59.74

initial dtw = 28.93

1215 Begin purging @ 75A/30psi @ 20/10 cyc.

1318 45I cell filled @ 1318

1407 Collect sample 0670 MW 28 GW
filter purge volume = 200 mL

1530

1430 - close MW 27 & MW 28 after completing fz. protection procedure

1530 - Set up on MW 43. initial dtw = 89.24

1545 - Start pumping

1610 - Water @ top of casing, pumping @ 120ft/50psi 5/10 cycle

1640 - Water no longer moving up the line, not getting flow w/ snuttle @ 135 ft & 40/20
Decide to pull pump & inspect line

Location Red Devil Mine Date 6/18/20 35

Project / Client 1001095, 0026.25

2020 Spring Baseline

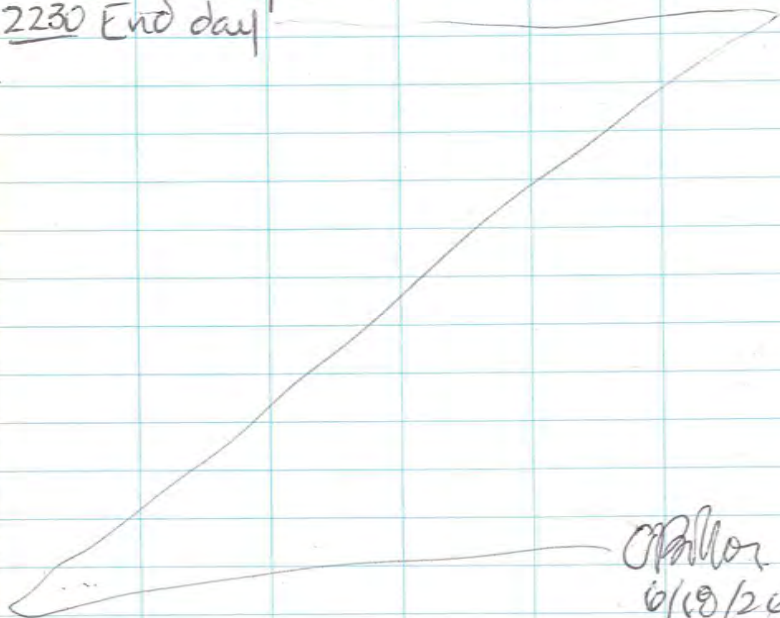
1700 Pulled pump, no damage to line, so decide to open pump & inspect bladder. Bladder is fully compressed (memory) w/ no pressure applied when pump is disassembled. Decide to replace bladder. Compressed bladder is likely due to freeze protection procedure. Need to attempt ~~procedure~~ ^{purge} on other deep wells to see if they are similarly damaged. May need to prioritize bladder replacement based on # of replacement bladders on hand.

1828 Measure DTW @ 37.48 at MWS6, remove Levellogger serial # 0042073183

1835 Pull pump in MWS6 to inspect tubing for possible replacement. Remove ~ 1 ft of damaged waterline. Open pump to inspect bladder and it is intact/fully expanded. Water line is free of water to frost depth. Redeploy pump to original depth.
1850 Begin purging at MWS6

Location Red Devil Mine Date 6/18/20Project / Client 1001095.0026.052020 Spring Baseline

- 2027 Collect sample 10420MWS6 GW
after stabilizing WQ. 90 ft ga / 5/10 cycl.
- 2100 Close MWS6 without completing
freeze protection procedure. Need
to assess potential damage to bladders
on deeper wells before proceeding. We
will return & complete if safe.
- 2130 Depart site for lodge
- 2200 Arrive lodge, put away equipment &
ice samples
- 2230 End day



OP Miller
6/18/20

Location Red Devil Mine Date 6/19/20Project / Client 1001095.0026.052020 Spring Baseline

- 0845 Muster for H^{1/2} S meeting
Topics: Wildlife Weather: Partly cloudy
Today's plan: T1 & T2 sample MWS9,
MW40, MW50 & MW45 - hitting
the deepest wells to inspect for damaged
bladders & tubing.
- 1030 Depart lodge for site
- 1100 Arrive at MW40 for setup
PTW measured at 129.05.
- 1135 Filling flow cell @ 150 ft ga / 70 psi - 20 PM
- 1224 Increased pressure to 80 psi
Volume @ is 0.14 LPM. continued
taking parameters.
- 1313 Parameters stabilized, began
taking samples
- 1300 (late entry) C Biller up to MW59 to assist
with pulling pump / troubleshoot no flow
- 1326 Sampled 10420MWS6 GW / Audrey Hoppel
- 1400 Collected FB041 & demobed
from MW40 to MWS9 for
team meeting
- 1415 Discuss ruptured bladders w/M.L.
will attempt to get replacements shipped
to site. Will inspect all tubing at bladder

Location Red Devil Mine Date 6/19/20Project / Client 1001095.0026.052020 Spring Baseline

- 1415 (cont'd) wells for damage prior to sampling.
- 1500 Set up on ~~MWS1~~ MWS1, initial dtw = 40.45
- 1520 Pull pump @ MWS1 to inspect tubing prior to purging. Tubing appears intact, and not damaged. Redeploy to original inlet depth $\frac{1}{2}$ begin purging
- 1530 Begin purge @ MWS1, target throttle of 85 ft ga, 5/10 cyc. Steady rain begins
- 1557 Water filling flow thru cell. Turbid
- 1659 Ran out of gas in generator, stop taking WQ parameters $\frac{1}{2}$ refill, continue to purge off of remaining air in compressor
- 1815 Resume WQ parameter measurement
- 1858 Stabilize WQ @ MWS1, turbidity ~ 10 NTU
- 1907 Collect sample 10620MWS1GW
- 1930 Demob from MWS1 to MWS0 to check tubing for damage, repair if necessary, redeploy - allowing turbidity to settle prior to sampling tomorrow.
- 2015 No damage found, redeploy MWS0 pump to original inlet depth $\frac{1}{2}$ close well, head to T2 @ MW 44. Discuss likely cause of kinking is pulling up on safety line when opening. Dedicated caps could mit.
- 2130 Return from lodge to site to ferry AH $\frac{1}{2}$ end day at 2200
- CB. 1102 4/19/20

Location Red Devil Mine Date 6/20/20Project / Client 1001095.0026.052020 Spring Baseline

- 0900 Site H $\frac{1}{2}$ S meeting: topics weather, mass wasting near Lenore's house
- Today's plan
- T1: CB, CE sample MW10, MW16, MWS8
- T2: MTM, BA, AH samp MWS4, MWS7
- 1055 Team 1 depart for site $\frac{1}{2}$ will stop to inspect mass wasting / ^{subgrade movement} slope failure on road to site near Lenore's house
- 1230 CB, MTM, AH $\frac{1}{2}$ CE completed inspection of the slope. We think we can safely drive across for today but noted that ^{tension} pressure cracks in the road appear larger after yesterday's rain. Will consult with ML $\frac{1}{2}$ MMemun regarding ability to access site safely
- 1300 Set up on MW10 - will begin purge w/o inspecting tubing since this well was pulled for barb replacement.
- 1335 Begin purging MW10 4 CPM ^{7:57 7:54}
- 1456 Stabilized WQ @ MW10
- 1504 Collect sample 10620MW10GW
- 1600 Head to MWS8, note filter purge was 250ml at MW10.
- 1705 Begin purging @ MWS8, 60 ft ga / ⁵ 10 disch ^{refill}

Location Red Devil Mine Date 6/20/20Project / Client 1001095.0026.052020 Spring Baseline

EE

1830 - Stabilized WQ at MW581833 - Collect sample 0620MW58GW

Approximate Flow rate visually appeared to decrease during sampling even though pressure remained stable.

1937 - Complete sampling.

2015 - Arrive at MW53. The airline tubing at MW53 is very short, airline is ziptied to water line. Pulled up on air and water line to connect to pump controller. May want to replace air-line if time permits. DTW: ~~34.00~~

2150 - Stabilized WQ at MW53. Collect sample 0620MW53GW

2210 - Complete sampling.2300 - End Day

L-EM
6/20/20

Location Red Devil Mine Date 6/21/20Project / Client 1001095.0026.052020 Spring Baseline

0915 - Site H₂S meeting; topics buddy system, glove protection, knife safety.

Today's plan:

T1: CB, CE sample MW55, MW46, MW54

T2: BA, AH sample MW48, MW06, MW16

MTM to stay at lodge for sample processing

1050 - Team 1 and 2 depart for site1110 - Arrive at MW55. DTW - ~~44.00~~ 14.00

1135 - Start pumping. Orange precipitate visible in the first

1148 - Drained flow through cell due to initial turbidity. Resume pumping

1240 - Stabilized WQ at MW55.

Turbidity stabilized near 30 NTU.

Collect sample 0620MW55GW.

Collect field duplicate of MW55, 0620MW102GW Field filter purge volume: 400 mL

1330 - Complete sampling.1420 - Arrive at MW46. DTW - 35.40

1430 - Start purging at MW46. $\frac{60 \text{ ft}^3}{4 \text{ cfm}}$

1520 - Stabilized WQ at MW46. Collect sample 0620MW46GW Field filter purge volume: 200 mL

1615 - Complete sampling.

Location Red Devil Mine Date 6/21/20Project / Client 1001095.0026.052020 Spring Baseline

1030 - (late entry) Calibrate YSI 556 mps
Serial number 06H1223 with calibration
solutions detailed previously.

~~1650~~¹⁶⁵⁰ - Arrive at MW 54. DTW: 29.98

1655 - Collect sample **FBOG**

1715 - Start purging at MW 54.

1750 - Pumping at 55 ft ga 20 refill, 10 discharge cycle.
Water stopped flowing, decided to pull the pump.

1815 - Inspected the tubing, found no obvious
signs of damage. Decided to open up pump for
further inspection. Found no obvious signs of
damage, observed superficial scarring on the
surface of the bladder from manufacturer install.
Inspected the bushing and barb, did not observe
any damage.

1855 - Resume purge.

1900 - Water flowing through meter. 50 ft ga, 2 cpm.
20 refill, 10 discharge. Seems that pulling out the
tube may have released a kink.

1931 - Stabilized WQ at MW 54. Collect sample
OG20MW54GW. Field filter purge volume.

2015 - Close MW 54 without completing freeze
protection purge

2115 - Arrive lodge - end day

C. D. Miller 6/21

Location Red Devil Mine Date 6/22/20Project / Client 1001095.0026.052020 Spring Baseline

830 Download pressure transducer
data:

SERIAL	WELL	NAME	DATE	TIME	W.L.
77844	39	Baro	6/17/20	2034	
77954	51	B	"	2111	40.12'
77952	54	E	"	2048	29.77'
77953	50	A	"	2058	48.42'
77947	58	C	6/16/20	¹⁹²⁴ 2124	30.92'
77927	53	D	6/17/20	2133	31.72'
67275	57	F	6/16/20	1412	34.12'
78183	56	G	6/18/20	1828	37.48'

0945 H₂S mitg: slip/trip/fall, demob
safety. Today's plan:

~2PM Ryan air will plm T2
MTM & AH, taking all samples
to date in rental equip. TA
samples will ship via Gold Strk.
ANC → SEA, for pickup by TA

1000 All staff ~~cont~~ work on Sump
processing & demob tasks

1245 Collect rinsate off 2 replacement
bladders as **RSO2**. Decanned each
bladder w/ Alconox sol'n & Typell DI

44 Location Red Devil Mine Date 6/22/20

Project / Client 1001095.0026.05

2020 Spring Baseline

1245 (cont'd) And collected rinseate pour of BAL DI into sample containers

1510 Ryan Air land to P/u MTM, AH and Batch 1 TA samples.

1545 Ryan air flight depart RDV → ANC

1550 Complete transducer data download & restart for deployment. Note, logger time is synchronized to CB computer, which is pacific time zone.

1420 Team 1 depart lodge for site

1330 (late entry) install replacement bladders on pumps for MW59 & 43. Work performed on a clean work-space at the lodge.

1435 Set up on MW59 to redeploy pump, taking extreme caution to reverse coil line & avoid kinks during deployment.

Top of pump set @ 151.49
Inlet = 153.17. Steady rain

1825 Begin purging @ MW59, moving throttle in 10 ft inc. every 2-3 cycles above 100 ft ga. to max (target) throttle of 170 ft ga.

45 Location Red Devil Mine Date 6/22/20

Project / Client 1001095.0026.05

2020 Spring Baseline

1930 Get consistent water flow at MW59, pumping at 80 psi - 190 ft. ga. and 10/20 cpc.

1940 Deploy Barologger at MW39 (dry) 2039 - Stabilized water at MW 59. Collect

sample 0620 MW59 GW, Filter purge 200.

2110 Collect field blank FBO7 light rain

2130 - Complete sampling. Depth to top of pump 151.49 ft.

2155 - Head over to MW43 to assist BA with purge.

2245 - Depart site for lodge, see T2 logbooks for notes on MW43 failed purge. Will re-attempt tom. with replacement tubing to rule out tubing kink/damage, and incr. throttle pressure.

0015 (6/23/20) Finish icing samples and end day.

OP Miller 6/22/20

46 Location Red Devil Mine Date 6/23/20

Project / Client 1001095.0026.05
2020 Spring Baseline

0915 H₂S meeting; Long hours/fatigue
Stop work/veto power. CB, BA, CE
present. Today's plan:

CB, CE reatt. MW43 w/ new tubing
Deploy transducer photo NTCRA
Ryan Air flight @ 8 PM

1145 Set up on MW43

1300 Initial depth to water: 89.42' GTOIC
Begin purge of MW43. Collect sample FB08

1344 Deploy transducer #73183
in MW56, dtw = 38.29

1425 " #77954
in MW51 dtw = 40.05

1435 " #77952
in MW54 dtw = 29.99

(late entry) stabilize WQ of MW43
pumping at 120 ft/gal/55psi, 20% cyc

1411 (late entry) collect sample
0620 MW43 GWL, filter purge ~250 mL
light/intermittent rain begins

1545 Stop at NTCRA for photos for ^{Regium}USACE

1622 Deploy transducer #77953
in MW50 dtw = 48.85

1637 Deploy transducer #77947
in MW58 dtw = 31.42

Location Red Devil Mine Date 6/23/20⁴⁷

Project / Client 1001095.0026.05
2020 Spring Baseline

1653 Deploy transducer #77927
in MW53 dtw = 32.40

1700 Deploy transducer #67275
in MW57 dtw = 34.90

Depart site, locked gates
1730 Arrive lodge to finalize
demob procedures, including
sanitizing per COVID protocol
plan. Ryan air expected
@ 19:30

2000 Depart RDV → ANC with
CB, BA and CE, and remaining
samples and gear/rental equip.

2130 Land ANC, begin moving gear
to warehouse.

2200 Load samples & rental equip into
Yukon & go to hotel. Will process
& re-ice samples & store in room

2300 End day

C. Miller 6/23/20

RDM Baseline F19, S20, F20 T2



Rite in the Rain
ALL-WEATHER
**ENVIRONMENTAL
FIELD BOOK**
No 559

RDM Baseline
Monitoring
TEAM 2
Fall 2019
Spring 2020
Fall 2020

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26 Location Red Deer Lodge Date 6/17/20
Project / Client RDM Spring Baseline
Monitoring

BEGIN SPRING 2020

BASELINE MONITORING

0845 - Muster for breakfast and H+S meeting. Weather today is forecasted to be overcast, with chance of rain. Plan for today is to conduct surface water sampling and stream flow measurement and groundwater snapshot. Topics for H+S meeting are safety on back roads for ATV, especially because we haven't been to the site in some time. Reviewed safety protocols for exiting ATV in the event of a de-stabilized ATV.

1000 - Calibrate YSI 556 MPS, serial # 15E103127. Calibrate conductivity, pH, and ORP.

conductivity: 1413 μ S/cm solution
lot # CC18623, Exp: 6/15/20

27 Location Red Deer Lodge Date 6/17/20
Project / Client RDM Spring Baseline
Monitoring

(1000) - pH 7; CC634551, exp. 8/7/21
pH 4: CC66195, exp 2/10/22
pH 10: CC632043, exp 7/22/21
ORP: 240 mV: 3054, exp 6/23

Calibration successful

1130 - Depart for site and ferry team members. Team # 2 for surface water sampling is A. Happle, C. Escoda, M. Talavia-Murray.

1138 - Team #1 collects 0201FBO1 at RDC delta.

1150 - Begin collecting sample 10620 RDD8SW. Field filters were not double-bagged, but utilize clean hands dirty hands method. Purge 3 mins.

1218 - Raining. Complete sample collection.

1237 - Begin collection of discharge measurements.

mm

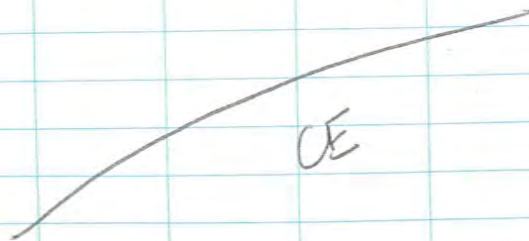
Location Red Devil Mine Date 6/17/20
 Project / Client RDM Spring Baseline
Monitoring 2020

1RD08 Weather: drizzling 100% of flow
 wetted width: 3.5'

Distance (ft)	Velocity (ft/sec)	Depth (ft)
0	0 ^{min}	0 RB
0.5	0.98 1.34	0.2
2.0	3.13 + 47 min	0.4 0.3
2.5	3.48	0.2
3.0	1.65	0.2
3.5	1.67	0.2
4.0	-0.05	0.2
4.5	0	0 LB

1320 - Arrive at ~~RAWO~~ RD06 to collect SW sample.

1329 - Begin collecting sample
0620RD06SW . Sampling ended 13:58 PM



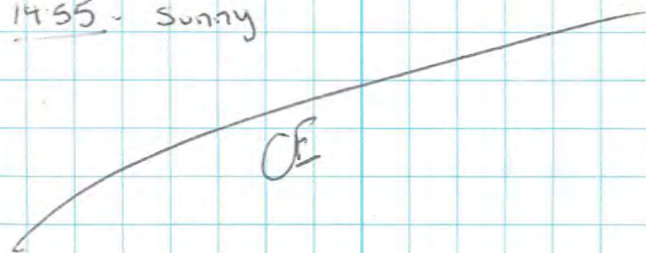
Location Red Devil Mine Date 6/17/20
 Project / Client Spring Baseline Monitoring
2020

1RD06 Weather: ~~rain~~ cloudy
 wetted width 5'
 % flow captured: 100

Distance (ft)	Depth (ft)	Velocity (ft/sec)
0	0	0 RB
3	0	0
3.5	0.15	0.57
4	0.2	0.75
4.5	0.2	1.2
5	0.3	1.18
5.5	0.2	1.81
6	0.2	1.59
6.5	0.2	1.28
7	0.35	1.11
7.5	0.15	0.47 LB

14:37 - Begin collecting sample
0620RD05SW . Sampling ended 1500.

14:55 - Sunny



Location Red Deer Mine Date 6/17/20Project / Client Spring 2020 BaselineMonitoringRD05

Weather: Sunny 1518

Wetted width: 1'

% Flow captured: 100%

Distance (Ft)	Depth (Ft)	Velocity Ft/sec
0.5 IE	0.15 IE	0.4 IE

0.5

~~0.15~~ IE

0.15

~~0.4~~ IE

1.1

Manipulated the channel from the seep for flow measurement. Could not use bucket method. Created 1 foot

channel w/ laminar flow

1342 - Begin collecting sample 0620RD05 SW

Collect field duplicate 10620RD99 SW

1631 - Complete sample collection

1635 - Begin streamflow measurement

RD15

Weather: sunny

Wetted width:

% flow captured

SEE NEXT

PAGE

mm

Location Red Deer Mine Date 6/17/20Project / Client Spring 2020 BaselineMonitoringDistance (ft)Depth (ft)Velocity (ft/sec)

2

0.15

0

RB

2.5

0.15

-0.03

3

0.2

-0.02

3.5

0.3

0.16

4

0.5

0.53

4.5

0.5

0.80

5

0.5

1.00

5.5

0.5

0.77

6

0.35

0.4

6.5

0.2

0.22 UB

Weather: Sunny

Wetted width: 4.5 ft

% Flow captured: 100%

1730 - Arrive at RD10 SW to collect sample 0620RD10 SW and matrix spike of metals analytes. Former loc. of RD10 no longer has flow, the channel has shifted to the south, closer to MW01.

173

1800 - Complete sample collection

Location Red Devil Mine Date 6/17/20Project / Client Spring 2020 Baseline
Monitoring**RD10**Weather: ^(MTM) Sunny

Wetted width: 6

% Flow captured: 85%

Distance (Ft)	Depth (Ft)	Velocity (Ft/s)	
2	0	0	LB
2.5	0.15	0.18	
3	0.2	0.42	
3.5	0.25	0.44	
4	0.25	0.55	
4.5	0.3	0.71	
5	0.3	1.00	
5.5	0.2	-0.29	
6	0.15	0.39	
6.5	0.15	0.61	
7	0.15	0.17	
7.5	0.2	0.23	
8	0.2	0.38	RB

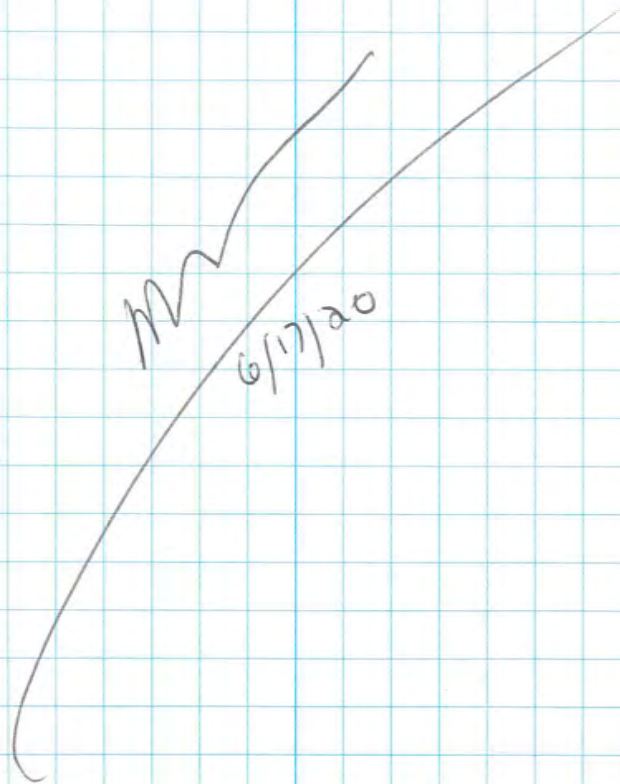
^(MTM)
1830 - Complete streamflow measurement.

Ferry A. Happel back to lodge. Field team to assist the completion of groundwater snapshot. Notes from GW snapshot are kept in separate field form.

2034 - Remove barrel logger from MW39.
Continue GW snapshot.Location Red Devil Mine Date 6/17/20Project / Client Spring 2020 Baseline
Monitoring

2200 - Complete GW snapshot and depart site for lodge.

2245 - End day. Back up streamflow form. Samples stored on ice in coolers.



Location Red Devil Mine Date 6/19/20
 Project / Client Spring 2020 Baseline Monitoring

0930 - Muster for breakfast and discuss plan for today: ① Begin GW sampling at MW27, MW28, MW42, MW43.

Weather today is 20% chance of rain, high of 61°F.

0945 - 1hr H&S meeting. Topics discussed include bringing more beverages to the site to ensure that we are adequately hydrated. Also discussed clearing roads of brush to ensure safe driving.

1000 - Calibrate YSI 536 MPS meters:

Serial #s: 15E103127 and 11H101095.

Used same solution as yesterday. Calibration successful. ^{MTM}

1130 - Depart lodge for site. Arrive at site and drop C. Escoda. Return to lodge to fetch Antappel.

1200 - Return to site and MW27 to begin low flow purge.

1225 - DTW: 30.22' btoic. Top of pump at 32.63' btoic.

1250 - Begin low flow purge of MW27.

1350 - Collect sample 10020MW276C0.

3 min purge on field filter @ approx. 650 mL.

Location Red Devil Mine Date 6/18/20
 Project / Client Spring 2020 Baseline Monitoring

1433 - Collect 10020FB03 from MPA in vicinity of MW27.

1500 - Arrive at MW42. DTW ^{MTM} 127.83' btoic. Top of pump 133' btoic.

1515 - Begin low flow purge of MW42.

1615 - No water at 70 psi. Pull pump. ⁱⁿ kink in water line.

1650 - Redeploy pump and resume purge. Pump settings @ 160'/70 psi and 20/10.

1850 - Collect sample ~~10020~~ ^{MTM} 10020MW426W1.

1915 - Complete sample collection. Did not do freeze protection at this time. Checked w/ C. Billor and determined that we may wait and purge the water line at a later date.

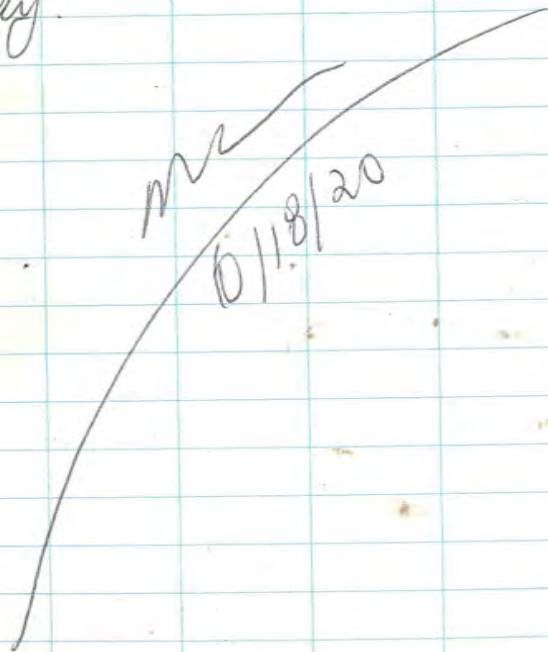
1950 - Arrive at MW17. DTW 15.55' btoic. pump ^{MTM} tubing inlet set at pre-defined depth (kink in tubing).

1953 - Begin pumping.

2034 - Stop pumping, meter not draining.

Location Red Devil Mine Date 6/18/20
 Project / Client Spring 2020 Baseline Monitoring

- 2039 - Resume pumping.
2115 - Collect sample [0620 MW17Gw]
 Collect 650 mL purge through field filter.
2130 - Complete ^{sample MFM} low flow purge of MW17.
2145 - Return to lodge.
2200 - Ice samples and end day.



Location Red Devil Mine Date 6/19/20
 Project / Client Spring 2020 Baseline
MTM, AH, CE Monitoring 1001095.002605

- 0830 - Muster for breakfast and discussion of day's plan. Team 1 to replace bladder on pump from MW13, Team 2 to continue GW sampling from deepest to shallower wells: MW59, MW40, MW50, MW45
0945 - Calibrate YSI 556mPS meters: serial #s: 15E103127 (Team 2) and 11H101295 (Team 1). Same solutions, calibration successful.
 (CE) 1030 Depart lodge for site. Arrive at site and drop C. Escoda. Peter M. Talora-Murray Returns to lodge to fetch A. Happel.
1125 - Return to site and MW 59 to begin low flow purge.
1150 - DTW: 132.52' btoic. Begin pumping. low flow purge
1230 - No water at 80 psi. Pull pump. Water line is kinked and water found in airline. No visible holes in bladder. Attempting to troubleshoot problem.
1300 - After troubleshooting determined there is a hole in the bladder.

38 Location Red Devil Mine Date 6/19/20
Project / Client Spring 2020 Baseline
MTM, AH, CE Monitoring 1001095.0026.05

1325: Due to the kinking problems with the tubing, will start pulling tubing to check for kinks before purging wells. C. Billor and M. Talala-Murray will discuss this plan with M. Longtime.

1440 - Arrive at MW 45. Pull pump to find kink at bottom of water line.

1510 - DTW: 46.09' btoic. Begin low flow purge of MW 45.

1545 - Begin raining.

1750 - Collect sample CG20 MW45 GW

1810 - Complete sampling at MW 45. Volume of the filter purged: 700 mL.

1840 - Arrive at MW 45 MW 44

1850 - DTW: 34.64' btoic. Begin low flow purge of MW 44

1900 - No water at 30 psi. Pull pump. Find kink at bottom of water line.

1915 - Resume purge. 35 psi. 11.5 fill, 9.00 discharge

2105 - Collect sample CG20 MW44 GW

2130 - Complete sample collection depart

2200 - Arrive at ledge. End day. CB 6/19/20

39 Location Red Devil Mine Date 6/20/20
Project / Client Spring 2020 Baseline
Monitoring 1001095.0026.05

0930 - HAS meeting. Terrain cracking on road by Leonore's house has grown. Discuss plan for assessing slope stability. If the bank is undercut, we will determine whether to access the site. Other topics included debris for the weather and lightning. Plan for today: Sample MW10, MW16, MW54, MW57, MW58.

1000 - Calibrate YSI MP56 using same cal solution. Calibration successful.

06H/223: Team 1

15E103/27: Team 2

1150 - met up w/ Catharine + Courtney, to look at cracks in road + slope of bank near river on way to mine.

1230 - left for mine, ~~at~~ and drove to ^{monitoring} well 57.

1300 - arrived at MW-57 and setup.

1315 - deployed water meter and after tubing was removed, don't feel need to pull pump, will try for water; if no water we will pull pump for kinks.

1320: DTW: 34.53 ft bgs from top of casing.

400:

Location Red devil Mine Date 6/20/2020

Project / Client Spring 2020 Baseline Monitoring
MTM, AH, BA 1001095.0026.05

1325 - Begin low flow purge of MW57.
Pump @ 30 psi and 11/9 discharge cycle.

1356 - Collect sample 0620 MW576W,
Purge 450 mL for 3 min through filter.

1422 - Complete sample collection. Plan is to
move to MW50.

1435 - arrived at MW50 and setup for
sampling.

1453: 48.00 ft bags from Top of casing.

1508: collected FBUS. ^(MTM) Plan is to
sample MW47.

1646 - Collected sample 10620 MW506W.
Pump 45 psi and 10/5 cycle. 500 mL filtered
over 3 min purge.

1720 - left for MW47

1730 - arrived at MW47 and setup for
sampling.

1737 - 38.05 ft bags ~~from~~ from Top of casing.

1753 - began collecting parameters

18:20 Parameters stabilized

1921 - Collect sample 10620 MW476W.
600 mL purged through field filter.

1900 - MW52 setup for sampling.

Location Red devil Mine Date 6/20/2020

Project / Client Spring 2020 Baseline Monitoring
1001095.0026.05

1904 - 32.94 ft bags from Top of casing.

1925 - Pull hose 20 ft to check for kink, saw
water was in hose, and coming up. Re-deployed
hose into well and continued pumping.

2024: began sampling 10620 MW526W +
10620 MW1006W Psi: 25 + 20/10 cycles

Time of field duplicate is 2027.

550 mL purged from field filter

2105 completed sampling of MW52

Demobilized from site as rain cancelled.

6/20/20
Bell

Location Red Devil Mine Date 06/21/20Project / Client Spring 2020 Baseline

Audrey H. + Bayon A. 1001095.0026.05

0915 #15 meeting. Discussed knife safety & using sharp knives for tube cutting. Plan for today: Sample MW06, MW16, MW48.

1030 calibration - YSI 556 mPS

TR Serial # 15E103127.

1100 - left for site and MW48

1120 - Arrived at MW48 and set up for w/ peristaltic pump

1125 - 20.75 ft BGS @ TOC

1127 - Began pumping @ MW48

1150 - Sample & collected at MW48 → 0621 MW48 GW
+ 0621 MW16 GW

1200 - purged 1L of water from filter.

1230 Demob from MW48 - w/36 to MW06

1245 Arrive @ MW06 & set up. OC is constructed of square tubing

1305 DTW @ 18.20'

1445 - PH went negative and we used DI and then drinking water to bring PH back up.

1455 - device adaptor appears to be broken; will sample well because it was stable previously.

Location Red Devil Mine Date 06/21/2020Project / Client Spring 2020 Baseline

1001095.0026.05

~~1501~~
~~1457~~ - began sampling 0621 MW06 GW
also collected mpsms0 at this well.

1535 - 2000 mL purged from filter.

1635 - Arrived at ~~the~~ cabin to switch out YSI's, and calibrate.

1640 - calibrated YSI w/ new probe

1837 Arrived at MW16. DTW 14.46'

Set up pump and began pumping. Heavy sediment pumped out initially. Pumped until water cleared up.

Began taking readings. Turbidity ~ 60 NTU. DTW dropped to 16.5' after pumping out sediment. Slowed pump volume & DTW recovered.

2109 - began sampling 0621 MW16 GW
↳ rewrote for clarity - 0621 MW16 GW was collected

2140 - left for cabin

2200 - arrived back @ cabin

Audrey H. Bayon 06/21/2020

~~0730~~ - begin prepping to leave from RDV, prepared samples, equipment. Marique TM + Fluchaytt will fly out today - 556 mps

~~1010~~ - calibrated YSI 15E103127 - Serial # calibration successful.

~~2030~~ ^{BA} Arrived at MW43 and re-deploy bladder pump successfully. DTW 84.42

~~210~~ Set up pump began purge

~~2118~~ Set PSI to 60 & cycle to 5/10 then to 20/10 as previous year.

Weather - Raining

~~2230~~ no water produced from well
 - pulled well to inspect tubing
 - observed water in tubing
 - re-deployed pump and attempt to pump again

~~2345~~ Pump not producing water. Decided to remove pump & demob due to long day and need for pump inspection. Very concerned about damaging new bladder. No damage observed on air/water tubing when pump was removed.

BA

~~0915~~ - Team meeting held on logistics followed by H&S. Covered working shorter hours during wrap up. Demob planned for 9/24 pending air travel logistics.

~~1111~~ Calibrated YSI 556 mps 15E103127 - Calibration accepted - conductivity 2300 - 1431

~~061123~~ - calibration accepted except for cond - cleaned w/ DF by filling storage container & lightly shaking. Completed confidence check & Cond appeared in range @ 7450 -

this - 120 of range listed on bottle. Use device as back up only. Attempted 3rd cal of Cond. and was successful. 1370 = 1431.

~~1130~~ CB & CE depart to sample MW43 BA complete demob packing & disinfected per COVID safety plan. See JT logbook

BA/lor 6/23/20

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Data Usability Summary Report

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Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: March 9, 2021	Completed by: Eridania Marte

The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness based on applicable sections of the following guidelines.

- *Final Quality Assurance Project Plan, Baseline Monitoring, Red Devil mine, Alaska. May 2019.*
- *National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001, January 2017.*

Specific criteria for QC limits were obtained from the site specific QAPP. Compliance with the project QA program is indicated in the checklist and tables below. Any major or minor concerns affecting data usability are listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Laboratory	Sample Delivery Group	Project Code
Test America, Seattle	580-95586-1	1001095.0026.06

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	QC	ID Correct -ions
580-95586-1	WH	0620RS01	580-95586-1	6/16/2020 11:30			
580-95586-1	SW	0620RD05SW	580-95586-2	6/17/2020 14:44			
580-95586-1	SW	0620RD06SW	580-95586-3	6/17/2020 13:29			
580-95586-1	SW	0620RD08SW	580-95586-4	6/17/2020 11:50			
580-95586-1	SW	0620RD10SW	580-95586-5	6/17/2020 17:34		MS/MSD	
580-95586-1	SW	0620RD15SW	580-95586-6	6/17/2020 15:42			
580-95586-1	SW	0620RD99SW	580-95586-7	6/17/2020 15:55			
580-95586-1	WG	0620MW17GW	580-95586-8	6/18/2020 21:15			
580-95586-1	WG	0620MW27GW	580-95586-9	6/18/2020 13:50			
580-95586-1	WG	0620MW28GW	580-95586-10	6/18/2020 14:07			
580-95586-1	WG	0620MW42GW	580-95586-11	6/18/2020 18:50			
580-95586-1	WG	0620MW56GW	580-95586-12	6/18/2020 20:27			
580-95586-1	WG	0620MW40GW	580-95586-13	6/19/2020 13:26			
580-95586-1	WG	0620MW44GW	580-95586-14	6/19/2020 21:05			
580-95586-1	WG	0620MW45GW	580-95586-15	6/19/2020 17:50			
580-95586-1	WG	0620MW51GW	580-95586-16	6/19/2020 19:07			
580-95586-1	WG	0620MW100GW	580-95586-17	6/20/2020 20:27			
580-95586-1	WG	0620MW10GW	580-95586-18	6/20/2020 15:04			
580-95586-1	WG	0620MW47GW	580-95586-19	6/20/2020 18:21			
580-95586-1	WG	0620MW50GW	580-95586-20	6/20/2020 16:46			
580-95586-1	WG	0620MW52GW	580-95586-21	6/20/2020 20:24			
580-95586-1	WG	0620MW53GW	580-95586-22	6/20/2020 21:50			
580-95586-1	WG	0620MW57GW	580-95586-23	6/20/2020 13:56			
580-95586-1	WG	0620MW58GW	580-95586-24	6/20/2020 18:33			
580-95586-1	WG	0620MW06GW	580-95586-25	6/21/2020 15:01		MS/MSD	
580-95586-1	WG	0620MW101GW	580-95586-26	6/21/2020 11:50			
580-95586-1	WG	0620MW102GW	580-95586-27	6/21/2020 12:40			

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: March 9, 2021	Completed by: Eridania Marte

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	QC	ID Correct-ions
580-95586-1	WG	0620MW16GW	580-95586-28	6/21/2020 21:09			
580-95586-1	WG	0620MW46GW	580-95586-29	6/21/2020 15:20		MS/MSD	
580-95586-1	WG	0620MW48GW	580-95586-30	6/21/2020 11:50			
580-95586-1	WG	0620MW54GW	580-95586-31	6/21/2020 19:31			
580-95586-1	WG	0620MW55GW	580-95586-32	6/21/2020 12:40			

SDG	Matrix	Test Method	Number of Samples	Sample Type
580-95586-1	W	6010D – Metals ICP (Al, Ca, Fe, Mg, K, Na)	28	N
580-95586-1	W	6010D – Metals ICP (Al, Ca, Fe, Mg, K, Na)	4	FD
580-95586-1	W	6010D – Metals ICP (Al, Ca, Fe, Mg, K, Na)	2	LR
580-95586-1	W	6010D – Metals ICP (Al, Ca, Fe, Mg, K, Na)	3	MS/MSD
580-95586-1	W	6010D – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	5	N
580-95586-1	W	6010D – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	1	FD
580-95586-1	W	6010D – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	1	LR
580-95586-1	W	6010D – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	1	MS/MSD
580-95586-1	W	6020B – Metals ICP/MS	28	N
580-95586-1	W	6020B – Metals ICP/MS	4	FD
580-95586-1	W	6020B – Metals ICP/MS	2	LR
580-95586-1	W	6020B – Metals ICP/MS	3	MS/MSD
580-95586-1	W	6020B – Metals ICP/MS Dissolved	5	N
580-95586-1	W	6020B – Metals ICP/MS Dissolved	1	FD
580-95586-1	W	6020B – Metals ICP/MS Dissolved	1	LR
580-95586-1	W	6020B – Metals ICP/MS Dissolved	1	MS/MSD
580-95586-1	W	7470A – Mercury	28	N
580-95586-1	W	7470A – Mercury	4	FD
580-95586-1	W	7470A – Mercury	2	LR
580-95586-1	W	7470A – Mercury	3	MS/MSD
580-95586-1	W	7470A – Mercury, Dissolved	5	N
580-95586-1	W	7470A – Mercury, Dissolved	1	FD
580-95586-1	W	7470A – Mercury, Dissolved	1	LR
580-95586-1	W	7470A – Mercury, Dissolved	1	MS/MSD
580-95586-1	W	353.2 - Nitrogen, Nitrate-Nitrite	28	N
580-95586-1	W	353.2 - Nitrogen, Nitrate-Nitrite	4	FD
580-95586-1	W	353.2 - Nitrogen, Nitrate-Nitrite	2	LR
580-95586-1	W	353.2 - Nitrogen, Nitrate-Nitrite	6	MS/MSD
580-95586-1	W	SM2320B – Alkalinity	28	N
580-95586-1	W	SM2320B – Alkalinity	4	FD
580-95586-1	W	SM2320B – Alkalinity	3	LR
580-95586-1	W	SM2540D – Total Suspended Solids (TSS)	28	N

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: March 9, 2021	Completed by: Eridania Marte

SDG	Matrix	Test Method	Number of Samples	Sample Type
580-95586-1	W	SM2540D – Total Suspended Solids (TSS)	4	FD
580-95586-1	W	SM2540D – Total Suspended Solids (TSS)	2	LR
580-95586-1	W	SM2540C – Total Dissolved Solids (TDS)	5	N
580-95586-1	W	SM2540C – Total Dissolved Solids (TDS)	1	FD
580-95586-1	W	9060 Organic Carbon, Total (TOC)	5	N
580-95586-1	W	9060 Organic Carbon, Total (TOC)	1	FD
580-95586-1	W	9060 Organic Carbon, Total (TOC)	1	LR
580-95586-1	W	9060 Organic Carbon, Total (TOC)	1	MS/MSD

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	No. Anion analysis by EPA Method 300.0 was requested on COC as inorganic ions; however, was not analyzed by laboratory.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Yes.
Frequency of Field QC Samples Correct? Field Duplicate - 1/10 regular samples for each matrix and sampling method and/or type of equipment used. MS/MSD - 1/20 samples for each matrix and each sampling event. Equipment Blank - 1/20 field samples for each collection/decontamination method, by matrix and by sample type.	- Four field duplicates were collected per 28 groundwater samples. - Three MS/MSDs were collected for 28 groundwater samples. - An equipment blank was collected on discharge barb install on dedicated pumps.
Case narrative present and complete?	Yes.
Any holding time violations?	The following samples were analyzed outside of the technical holding time for TSS and TDS analysis: 0620RS01, 0620RD05SW, 0620RD06SW, 0620RD08SW, 0620RD10SW, 0620RD15SW, 0620RD99SW, and 0620MW17GW. The sample results were J/UJ qualified as estimated.

The following tables are presented at the end of this DUSR and provide summaries of results outside QC criteria:

- Method Blanks Results (Table 2, 2A, and 2B)
- Surrogates Outside Limits (Table 3)
- MS/MSD Outside Limits (Table 4 and 4A)
- LCS Outside Limits (Table 5 and 5A)
- Serial Dilution Outside Limits (Table 6)
- Reanalysis Results (Table 7)
- Field Duplicate Results (Table 8)

Go to List

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: March 9, 2021	Completed by: Eridania Marte

Metals by Method SW-846 6020B	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	Nickel was detected below the RL in method blank 580-331582/20-A associated with batch 580-331582. Nickel was detected below the RL in method blank 580-331580/11-A associated with batch 580-331580. There were no associated samples with this batch.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	The nickel result in five samples were detected at a value less than 5X the blank detection (580-331582/20-A) and U qualified as non-detect. Six samples were greater than 5X the blank detection, two out of the six samples were J qualified due to being below the RL. All other five associated sample results were non-detect for nickel and did not require qualification.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	Yes. All MS/MSD QC criteria were met. However, PDS for sample 0620RD10SW were recovered above the criteria for multiple analytes. No qualifications were made. All MS/MSD QC criteria were met. However, PDS for sample 0620MW06GW were recovered above the criteria for multiple analytes. No qualifications were made. The RPD values for LR for sample 0620RD10SW were outside of the acceptance criteria for arsenic and nickel. The sample results were less than 5x the RL. No qualification was made.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.998 and RSD between multiple exposures $\leq 5\%$? Minimum 4-point linearity.	The r value was not reported by the laboratory. The data are considered acceptable for use.
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	Yes.
Are serial dilutions within QC criteria (see Table 6)?	Yes.
Spot check ICS recoveries 80-120%.	The ICSs were within acceptance criteria.
Spot check ICV 90-110%.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 70-130%	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Table 2A and 2B).	Yes.
Spot check the internal standard recoveries 50-150%.	The internal standards were acceptable.

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: March 9, 2021	Completed by: Eridania Marte

Metals by Method SW-846 6020B	
Description	Notes and Qualifiers
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	All samples were diluted at 5-folds for dissolved and total metals.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Metals by Method SW-846 6010D	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	The laboratory performed a duplicate analysis on sample 0620RD10SW, and the sodium results exhibited an elevated RPD. The sample results were less than 5X the PQL; therefore, no qualification of the data was required.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ? Minimum 5-point linearity.	Yes.
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	Yes.
Are serial dilutions within QC criteria (see Table 6)?	No. Calcium and magnesium exhibited recovery above the acceptance criteria for samples 0620RD10SW (dissolved) and 0620MW06GW. The sample results were J qualified as estimated.
Spot check ICS recoveries 80-120%.	The ICSs were within acceptance criteria.
Spot check ICV 90-110% and < 20% RSD.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 50-150%.	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Table 2A and 2B).	Yes.
Spot check the internal standards – must be 30-120% of the intensity of the calibration blank.	The internal standards were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Mercury by Method SW-846 7470A	
Description	Notes and Qualifiers
Any compounds present in method or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: March 9, 2021	Completed by: Eridania Marte

Mercury by Method SW-846 7470A	
Description	Notes and Qualifiers
Is Laboratory QC frequency at least one blank, LCS and MS/MSD with each batch?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Yes.
Is LCS within QC criteria (see Table 5)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ?	Yes.
Spot check ICV 90-110%.	The ICVs were acceptable.
Spot check CCV 80-120%.	The CCVs were acceptable.
Spot check ICB/CCB detections (see Table 2A and 2B).	The CCBs were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Alkalinity by Standard Method 2320B	
Description	Notes and Qualifiers
Are any compounds present in method and/or field blanks as noted on Table 2?	Method blanks are not applicable to this technique.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	N/A
Is laboratory QC frequency at least one LCS and duplicate with each batch of up to 20 samples?	Yes.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration verification within QC limits?	Yes.
Is continuing calibration within QC limits?	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	No. Alkalinity/Bicarbonate Alkalinity as CaCO ₃ exhibited poor precision between the parent sample and duplicate sample for samples 0620MW52GW and 0620MW100GW. The sample results were J qualified as estimated values.

Anions by EPA Method 300.0	
Description	Notes and Qualifiers
Are any compounds present in method, continuing calibration, and/or field blanks?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	N/A
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria? QC limits are not applicable to sample results greater than 4 times spike amount. (see Table 4 and 4A)	Yes.

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Anions by EPA Method 300.0	
Description	Notes and Qualifiers
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 6)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 7)?	Yes.

Nitrate/Nitrite by EPA Method 353.2	
Description	Notes and Qualifiers
Any compounds present in method, continuing calibration, and/or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	The nitrate/nitrite recovery in samples 0620RS01, 0620RD05SW, 0620MW28GW, 0620MW06GW, 0620MW100GW, and 0620MW46GW were low in the MS and MSD. The results in the parent sample were non-detect in samples 0620RS01, 0620RD05SW, 0620MW28GW, and 0620MW06GW and UJ qualified as estimated non-detect. The results in the parent sample were detected in samples 0620MW100GW and 0620MW46GW and J qualified as estimated.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Total Suspended Solids by Standard Method 2540C/2540D	
Description	Notes and Qualifiers
Are any compounds present in method blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.

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Total Suspended Solids by Standard Method 2540C/2540D	
Description	Notes and Qualifiers
Is laboratory QC frequency one blank and LCS with each batch of 20 or fewer samples and one laboratory duplicate per 10 samples?	Yes.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Total Organic Carbon by Method SW-846 9060B	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch of 20 or fewer samples and one set of MS and one laboratory duplicate per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 3 and 3A)? QC limits are not applicable to sample results greater than 4 times spike amount.	Yes.
Are laboratory duplicates within QC limits?	Yes.
Is LCS/LCSD within QC criteria (see Table 4 and 4A)? If out, and the recovery high with no positive values, then no data qualification is required.	No. TOC was recovered above the acceptance criteria in LCSD 580-332532/35. The sample results for 0620RD05SW, 0620RD06SW, 0620RD08SW, 0620RD10SW, 0620RD15SW, and 0620RD99SW were J qualified as estimated.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 6)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 7)?	Yes.

Summary of Potential Impacts on Data Usability	
Concerns	
6020B	<ul style="list-style-type: none"> The nickel result in five samples were detected at a value less than 5X the blank detection (580-331582/20-A) and U qualified as non-detect.
6010D	<ul style="list-style-type: none"> Calcium and magnesium exhibited recovery above the acceptance criteria for samples 0620RD10SW (dissolved) and 0620MW06GW. The sample results were J qualified as estimated.
353.2	

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Summary of Potential Impacts on Data Usability	
Concerns	
9060	<ul style="list-style-type: none"> The nitrate/nitrite recovery in samples 0620RS01, 0620RD05SW, 0620MW28GW, 0620MW06GW, 0620MW100GW, and 0620MW46GW were low in the MS and MSD. The results in the parent sample non-detect in samples were UJ qualified as estimated non-detect. The results in the parent sample were detected were J qualified as estimated.
2320B	<ul style="list-style-type: none"> TOC was recovered above the acceptance criteria in LCSD 580-332532/35. The sample results for 0620RD05SW, 0620RD06SW, 0620RD08SW, 0620RD10SW, 0620RD15SW, and 0620RD99SW were J qualified as estimated.
	<ul style="list-style-type: none"> Alkalinity/Bicarbonate Alkalinity as CaCO₃ exhibited poor precision between the parent sample and duplicate sample for samples 0620MW52GW and 0620MW100GW. The sample results were J qualified as estimated values.

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Table 2 – List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qualifier	Units	MDL	PQL
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	J	mg/L	0.00062	0.015
6020B	MB 580-331580/11-A	MB	Nickel	0.000713	J	mg/L	0.00062	0.015

Table 2A – List of Samples Qualified for Method Blank Contamination

Method	Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qualifier	PQL	Affected Samples	Sample Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.016	B	0.015	0620RD05SW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	.001	J B	0.015	0620RD06SW	U Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.0011	J B	0.015	0620RD08SW	U Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.027	B	0.015	0620MW27GW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.0079	J B	0.015	0620MW28GW	J Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.019	B	0.015	0620MW42GW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.0084	J B	0.015	0620MW56GW	J Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.095	B	0.015	0620MW40GW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.0028	J B	0.015	0620MW44GW	U Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.00084	J B	0.015	0620MW45GW	U Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	0.001	J B	0.015	0620MW51GW	U Flag
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	ND		0.015	0620RS01	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	ND		0.015	0620RD10SW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	ND		0.015	0620RD15SW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	ND		0.015	0620RD99SW	None
6020B	MB 580-331582/20-A	MB	Nickel	0.00101	ND		0.015	0620MW17GW	None

Table 2B – List of Samples Qualified for Field Blank Contamination

N/A

Table 3 – List of Samples with Surrogates outside Control Limits

N/A

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Table 4 – List of MS/MSD Recoveries outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	MS	MSD	Low Limit	High Limit	Sample Qualifier
353.2	0620RS01	MS/MSD	Nitrate-Nitrite as N	ND	0.500	71	69	90	110	UJ Flag
353.2	0620RD05SW	MS/MSD	Nitrate-Nitrite as N	ND	0.500	36	28	90	110	UJ Flag
353.2	0620MW28GW	MS/MSD	Nitrate-Nitrite as N	ND	0.500	53	54	90	110	UJ Flag
353.2	0620MW06GW	MS/MSD	Nitrate-Nitrite as N	ND	0.500	20	19	90	110	UJ Flag
353.2	0620MW100GW	MS/MSD	Nitrate-Nitrite as N	1.6	0.500	58	61	90	110	J Flag
353.2	0620MW46GW	MS/MSD	Nitrate-Nitrite as N	0.56	0.500	80	77	90	110	J Flag

Table 4A – List of RPDs outside Control Limits

Method	Sample Type	Sample ID	Analyte	RPD	RPD Limit	Sample Qualifier
6010D	DUP	0620RD10SW	Sodium	49	20	None < 5x PQL
6020B	DUP	0620RD10SW	Arsenic	23	20	None < 5x PQL
6020B	DUP	0620RD10SW	Nickel	43	20	None < 5x PQL

Table 5 – List of LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	Sample Qualifier
9060	LCSD 580-332532/35	TOC	144	85	115	J Flag

Table 5A – List of RPDs outside Control Limits

None.

Table 6 – List of Serial Dilution Recoveries outside Control Limits

Method	Sample ID	Analyte	Orig. Result	Serial Dilution Result	MDL	%D	Sample Qualifier
6010D	0620RD10SW	Calcium	18	20.3	0.16	12	J Flag
6010D	0620RD10SW	Magnesium	10	11.4	0.13	13	J Flag
6010D	0620MW06GW	Calcium	33	37.9	0.16	16	J Flag
6010D	0620MW06GW	Magnesium	31	35.4	0.13	16	J Flag

Table 7 – Samples that were Re-analyzed

None.

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Table 8 – Summary of Field Duplicate Results

Method	Analyte	Unit	Matrix	PQL	0620MW55GW	0620MW102GW	RPD	RPD Rating
SM 2320B	Alkalinity	mg/L	WG	5	120	120	0.0%	Good
SW846 6020B	Antimony	mg/L	WG	0.004	0.0092	0.0087	5.6%	Good
SW846 6020B	Arsenic	mg/L	WG	0.005	0.025	0.022	12.8%	Good
SW846 6020B	Barium	mg/L	WG	0.006	0.11	0.11	0.0%	Good
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	WG	5	120	120	0.0%	Good
SW846 6010D	Calcium	mg/L	WG	1.1	27	26	3.8%	Good
SW846 6020B	Cobalt	mg/L	WG	0.002	0.0066	0.0061	7.9%	Good
SW846 6010D	Iron	mg/L	WG	0.5	20	20	0.0%	Good
SW846 6010D	Magnesium	mg/L	WG	1.1	19	19	0.0%	Good
SW846 6020B	Manganese	mg/L	WG	0.01	1.7	1.6	6.1%	Good
SW846 6020B	Nickel	mg/L	WG	0.015	0.0097	0.0092	5.3%	Good
SW846 6010D	Potassium	mg/L	WG	3.3	0.76	0.75	1.3%	Good
SW846 6010D	Sodium	mg/L	WG	2	6.1	5.8	5.0%	Good
SM SM 2540D	Total Suspended Solids	mg/L	WG	2	39	34	13.7%	Good
SW846 6020B	Vanadium	mg/L	WG	0.02	0.0034	0.0034	0.0%	Good

Method	Analyte	Unit	Matrix	PQL	0620MW52GW	0620MW100GW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	WG	5	51	26	64.9%	Poor	J Flag
SW846 6020B	Antimony	mg/L	WG	0.004	ND	0.00081	NC	Poor	< 5X PQL
SW846 6020B	Arsenic	mg/L	WG	0.005	0.0078	0.0073	6.6%	Good	None
SW846 6020B	Barium	mg/L	WG	0.006	0.01	0.0086	15.1%	Good	None
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	WG	5	51	26	64.9%	Poor	J Flag
SW846 6010D	Calcium	mg/L	WG	1.1	13	13	0.0%	Good	None
SW846 6020B	Chromium	mg/L	WG	0.004	0.0015	ND	NC	Poor	< 5X PQL
SW846 6020B	Cobalt	mg/L	WG	0.002	0.00053	0.00052	1.9%	Good	None
SW846 6010D	Magnesium	mg/L	WG	1.1	7.3	7.4	1.4%	Good	None
SW846 6020B	Manganese	mg/L	WG	0.01	0.033	0.03	9.5%	Good	None
SW846 6020B	Nickel	mg/L	WG	0.015	0.0022	0.0021	4.7%	Good	None
MCAWW 353.2	Nitrate Nitrite as N	mg/L	WG	0.15	1.6	1.6	0.0%	Good	None

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SW846 6010D	Sodium	mg/L	WG	2	2.9	2.9	0.0%	Good	None
SM 2540D	Total Suspended Solids	mg/L	WG	2	2.6	ND	NC	Poor	< 5X PQL
SW846 6020B	Vanadium	mg/L	WG	0.02	0.0041	0.0023	56.3%	Poor	< 5X PQL

Method	Analyte	Unit	Matrix	PQL	0620MW48GW	0620MW101GW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	WG	5	82	67	20.1%	Good	None
SW846 6020B	Antimony	mg/L	WG	0.004	0.002	0.00066	100.8%	Poor	< 5X PQL
SW846 6020B	Arsenic	mg/L	WG	0.005	0.0015	ND	NC	Poor	< 5X PQL
SW846 6020B	Barium	mg/L	WG	0.006	0.034	0.033	3.0%	Good	None
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	WG	5	82	67	20.1%	Good	None
SW846 6010D	Calcium	mg/L	WG	1.1	16	15	6.5%	Good	None
SW846 6010D	Magnesium	mg/L	WG	1.1	14	14	0.0%	Good	None
SW846 6020B	Manganese	mg/L	WG	0.01	0.0097	ND	NC	Poor	< 5X PQL
MCAWW 353.2	Nitrate Nitrite as N	mg/L	WG	0.15	1.6	1.5	6.5%	Good	None
SW846 6010D	Potassium	mg/L	WG	3.3	0.43	0.41	4.8%	Good	None
SW846 6010D	Sodium	mg/L	WG	2	1.8	1.8	0.0%	Good	None
SW846 6020B	Vanadium	mg/L	WG	0.02	0.0035	0.0036	2.8%	Good	None

Method	Analyte	Unit	Matrix	PQL	0620MW48GW	0620MW100GW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	WG	5	67	65	3.0%	Good	None
SW846 6020B	Antimony	mg/L	WG	0.004	0.04	0.042	4.9%	Good	None
SW846 6020B (Dissolved)	Antimony	mg/L	WG	0.004	0.039	0.037	5.3%	Good	None
SW846 6020B	Arsenic	mg/L	WG	0.005	0.014	0.014	0.0%	Good	None
SW846 6020B (Dissolved)	Arsenic	mg/L	WG	0.005	0.012	0.012	0.0%	Good	None
SW846 6020B	Barium	mg/L	WG	0.006	0.025	0.026	3.9%	Good	None
SW846 6020B (Dissolved)	Barium	mg/L	WG	0.006	0.023	0.023	0.0%	Good	None
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	WG	5	67	65	3.0%	Good	None
SW846 6010D	Calcium	mg/L	WG	1.1	17	18	5.7%	Good	None
SW846 6010D (Dissolved)	Calcium	mg/L	WG	1.1	17	17	0.0%	Good	None
SW846 6010D	Magnesium	mg/L	WG	1.1	9.6	10	4.1%	Good	None

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SW846 6010D (Dissolved)	Magnesium	mg/L	WG	1.1	9.7	9.4	3.1%	Good	None
SW846 6020B	Manganese	mg/L	WG	0.01	0.015	0.016	6.5%	Good	None
SW846 6020B (Dissolved)	Manganese	mg/L	WG	0.01	0.015	0.013	14.3%	Good	None
SW846 7470A	Mercury	mg/L	WG	0.0003	0.00026	ND	NC	Poor	< 5X PQL
SW846 6020B (Dissolved)	Nickel	mg/L	WG	0.015	0.00081	0.00074	9.0%	Good	None
MCAWW 353.2	Nitrate Nitrite as N	mg/L	WG	0.15	0.095	0.095	0.0%	Good	None
SW846 6010D	Sodium	mg/L	WG	2	1.5	2	28.6%	Good	None
SW846 6010D (Dissolved)	Sodium	mg/L	WG	2	1.9	1.8	5.4%	Good	None
SW846 9060	Total Organic Carbon	mg/L	WG	1.5	1.6	1.7	6.1%	Good	None
SW846 6020B	Vanadium	mg/L	WG	0.02	0.0033	0.0036	8.7%	Good	None
SW846 6020B (Dissolved)	Vanadium	mg/L	WG	0.02	0.0025	0.0024	4.1%	Good	None

Acronym List and Table Key:

CCB	=	continuing calibration blank
CCV	=	continuing calibration verification
CCVL	=	reporting limit continuing calibration verification
COC	=	chain of custody
CRDL	=	contract required detection limits
DRO	=	diesel range organics
DUSR	=	data usability summary report
FD	=	field duplicate
GRO	=	gasoline range organics
ICB	=	initial calibration blank
ICS	=	interference check standard
ICV	=	initial calibration verification
ICVL	=	reporting limit initial calibration verification
LCS	=	laboratory control sample
LCSD	=	laboratory control sample duplicate
LR	=	laboratory replicate
MB	=	method blank
MS	=	matrix spike

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Acronym List and Table Key:

MSD	=	matrix spike duplicate
N	=	normal sample
ND	=	not detected
PDS	=	post-digestion spike
PQL	=	practical quantitation limit
QA	=	quality assurance
QAPP	=	quality assurance project plan
QC	=	quality control
RB	=	rinsate blank
RL	=	reporting limit
RPD	=	relative percent difference
RSD	=	relative standard deviation
SDG	=	sample delivery group
TSS	=	total suspended solids

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The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness based on applicable sections of the following guidelines.

- *Final Quality Assurance Project Plan, Baseline Monitoring, Red Devil mine, Alaska. May 2019.*
- *National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001, January 2017.*

Specific criteria for QC limits were obtained from the site specific QAPP. Compliance with the project QA program is indicated in the checklist and tables below. Any major or minor concerns affecting data usability are listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Laboratory	Sample Delivery Group	Project Code
Test America, Seattle	580-95652-1	1001095.0026.06

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	QC	ID Corrections
580-95652-1	WH	0620RS02	580-95652-1	6/22/2020			
580-95652-1	WG	0620MW43GW	580-95652-2	6/23/2020			
580-95652-1	WG	0620MW59GW	580-95652-3	6/22/2020			

SDG	Matrix	Test Method	Number of Samples	Sample Type
580-95586-1	WG	6010D – Metals ICP (Al, Ca, Fe, Mg, K, Na)	2	N
580-95586-1	WH	6010D – Metals ICP (Al, Ca, Fe, Mg, K, Na)	1	RB
580-95586-1	WG	6020A – Metals ICP/MS	2	N
580-95586-1	WH	6020A – Metals ICP/MS	1	RB
580-95586-1	WG	7470A – Mercury	2	N
580-95586-1	WH	7470A – Mercury	1	RB
580-95586-1	WG	7470A – Mercury	1	LR
580-95586-1	WG	7470A – Mercury	1	MS/MSD
580-95586-1	WG	353.2 - Nitrogen, Nitrate-Nitrite	2	N
580-95586-1	WH	353.2 - Nitrogen, Nitrate-Nitrite	1	RB
580-95586-1	WG	353.2 - Nitrogen, Nitrate-Nitrite	1	LR
580-95586-1	WG	353.2 - Nitrogen, Nitrate-Nitrite	1	MS/MSD
580-95586-1	WG	SM2320B – Alkalinity	2	N
580-95586-1	WH	SM2320B – Alkalinity	1	RB
580-95586-1	WG	SM2540D – Total Suspended Solids (TSS)	2	N
580-95586-1	WH	SM2540D – Total Suspended Solids (TSS)	1	RB

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General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	No. Samples 0620RS02, 0620MW43GW, and 0620MW59GW did not include sample collection time documented on the chain of custody.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Temperature of the cooler was below acceptable criteria. However, samples arrived in good condition and with no observation of samples being frozen. No qualification was made.
Frequency of Field QC Samples Correct? Field Duplicate - 1/10 regular samples for each matrix and sampling method and/or type of equipment used. MS/MSD - 1/20 samples for each matrix and each sampling event. Equipment Blank - 1/20 field samples for each collection/decontamination method, by matrix and by sample type.	One rinsate blank collected on dedicated sample pump bladders. Field QC was included in SDG 580-95586-1.
Case narrative present and complete?	Yes.
Any holding time violations?	No.

The following tables are presented at the end of this DUSR and provide summaries of results outside QC criteria:

- Method Blanks Results (Table 2, 2A, and 2B)
- Surrogates Outside Limits (Table 3)
- MS/MSD Outside Limits (Table 4 and 4A)
- LCS Outside Limits (Table 5 and 5A)
- Serial Dilution Outside Limits (Table 6)
- Reanalysis Results (Table 7)
- Field Duplicate Results (Table 8)

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Metals by Method SW-846 6010C	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	N/A
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	Client specific QC was not run with this SDG.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.998 and RSD between multiple exposures $\leq 5\%$? Minimum 4-point linearity.	The r value was not reported by the laboratory. The data are considered acceptable for use.
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	Yes.
Are serial dilutions within QC criteria (see Table 6)?	Yes.
Spot check ICS recoveries 80-120%.	The ICSs were within acceptance criteria.
Spot check ICV 90-110%.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 70-130%	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Table 2A and 2B).	Yes.
Spot check the internal standard recoveries 50-150%.	The internal standards were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Metals by Method SW-846 6020B	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	Client specific QC was not run with this SDG.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ? Minimum 5-point linearity.	The r value was not reported by the laboratory. The data are considered acceptable for use.

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Metals by Method SW-846 6020B	
Description	Notes and Qualifiers
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	Yes.
Are serial dilutions within QC criteria (see Table 6)?	Yes.
Spot check ICS recoveries 80-120%.	The ICSs were within acceptance criteria.
Spot check ICV 90-110% and < 20% RSD.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 50-150%.	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Table 2A and 2B).	Yes.
Spot check the internal standards – must be 30-120% of the intensity of the calibration blank.	The internal standards were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	Yes. All samples were diluted at 5-folds.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Mercury by Method SW-846 7470A	
Description	Notes and Qualifiers
Any compounds present in method or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is Laboratory QC frequency at least one blank, LCS and MS/MSD with each batch?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Client specific QC was not run with this SDG; however, laboratory ran sample 0620MW43GW for QC and was within acceptable limits.
Is LCS within QC criteria (see Table 5)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ?	Yes.
Spot check ICV 90-110%.	The ICVs were acceptable.
Spot check CCV 80-120%.	The CCVs were acceptable.
Spot check ICB/CCB detections (see Table 2A and 2B).	The CCBs were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Alkalinity by Standard Method 2320B	
Description	Notes and Qualifiers
Are any compounds present in method and/or field blanks as noted on Table 2?	Method blanks are not applicable to this technique.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	N/A
Is laboratory QC frequency at least one LCS and duplicate with each batch of up to 20 samples?	Unable to determine from the report. If a duplicate sample was analyzed, it was not performed on a client specific sample.

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Alkalinity by Standard Method 2320B	
Description	Notes and Qualifiers
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration verification within QC limits?	Yes.
Is continuing calibration within QC limits?	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Nitrate/Nitrite by EPA Method 353.2	
Description	Notes and Qualifiers
Any compounds present in method, continuing calibration, and/or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Client specific QC was not run with this SDG; however, laboratory ran sample 0620RS02 for QC and was within acceptable limits.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Total Suspended Solids by Standard Method 2540D	
Description	Notes and Qualifiers
Are any compounds present in method blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch of 20 or fewer samples and one laboratory duplicate per 10 samples?	Yes.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Are laboratory duplicates within QC limits?	Unable to determine from the report. If a duplicate sample was analyzed, it was not performed on a client specific sample.

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Total Suspended Solids by Standard Method 2540D	
Description	Notes and Qualifiers
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Summary of Potential Impacts on Data Usability
Concerns
<ul style="list-style-type: none"> No data usability issues observed.

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Table 2 – List of Positive Results for Blank Samples

None.

Table 2A – List of Samples Qualified for Method Blank Contamination

None.

Table 2B – List of Samples Qualified for Field Blank Contamination

N/A

Table 3 – List of Samples with Surrogates outside Control Limits

N/A

Table 4 – List of MS/MSD Recoveries outside Control Limits

None.

Table 4A – List of RPDs outside Control Limits

None.

Table 5 – List of LCS Recoveries outside Control Limits

None.

Table 5A – List of RPDs outside Control Limits

None.

Table 6 – List of Serial Dilution Recoveries outside Control Limits

N/A

Table 7 – Samples that were Re-analyzed

None.

Table 8 – Summary of Field Duplicate Results

N/A

Acronym List and Table Key:

- CCB = continuing calibration blank
- CCV = continuing calibration verification
- CCVL = reporting limit continuing calibration verification

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Acronym List and Table Key:

COC	=	chain of custody
CRDL	=	contract required detection limits
DRO	=	diesel range organics
DUSR	=	data usability summary report
FD	=	field duplicate
GRO	=	gasoline range organics
ICB	=	initial calibration blank
ICS	=	interference check standard
ICV	=	initial calibration verification
ICVL	=	reporting limit initial calibration verification
LCS	=	laboratory control sample
LCSD	=	laboratory control sample duplicate
LR	=	laboratory replicate
MB	=	method blank
MS	=	matrix spike
MSD	=	matrix spike duplicate
N	=	normal sample
ND	=	not detected
PDS	=	post-digestion spike
PQL	=	practical quantitation limit
QA	=	quality assurance
QAPP	=	quality assurance project plan
QC	=	quality control
RB	=	rinsate blank
RL	=	reporting limit
RPD	=	relative percent difference
RSD	=	relative standard deviation
SDG	=	sample delivery group
TSS	=	total suspended solids

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The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness based on applicable sections of the following guidelines.

- *Final Quality Assurance Project Plan, Baseline Monitoring, Red Devil mine, Alaska. May 2019.*
- *National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001, January 2017.*

Specific criteria for QC limits were obtained from the site specific QAPP. Compliance with the project QA program is indicated in the checklist and tables below. Any major or minor concerns affecting data usability are listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Laboratory	Sample Delivery Group	Project Code
Brooks Applied Labs	2027020 EEI-SE1802	1001095.0026.06

Work Order	Matrix	Sample ID	Lab ID	Sample Date	QC	Comment
2027020	WQ	0620EB01	2027020-01	06/24/2020		Dissolved
2027020	WQ	0620FB01	2027020-05	06/16/2020		
2027020	WQ	0620FB02	2027020-06	06/17/2020		
2027020	WQ	0620FB03	2027020-77	06/18/2020		
2027020	WQ	0620FB04	2027020-07	06/19/2020		
2027020	WQ	0620FB05	2027020-08	06/20/2020		
2027020	WQ	0620FB06	2027020-09	06/21/2020		
2027020	WQ	0620FB07	2027020-02RE1	06/22/2020		
2027020	WQ	0620FB08	2027020-03RE1	06/23/2020		
2027020	WG	0620MW06GW	2027020-10	06/21/2020	MS/MSD	Total
2027020	WG	0620MW06GW	2027020-11	06/21/2020	MS/MSD	Dissolved
2027020	WG	0620MW100GW	2027020-12	06/20/2020		Total
2027020	WG	0620MW100GW	2027020-13	06/20/2020		Dissolved
2027020	WG	0620MW101GW	2027020-14	06/21/2020		Total
2027020	WG	0620MW101GW	2027020-15	06/21/2020		Dissolved
2027020	WG	0620MW102GW	2027020-16	06/21/2020		Total
2027020	WG	0620MW102GW	2027020-17	06/21/2020		Dissolved
2027020	WG	0620MW10GW	2027020-18	06/20/2020		Total
2027020	WG	0620MW10GW	2027020-19	06/20/2020		Dissolved
2027020	WG	0620MW16GW	2027020-20	06/21/2020	Lab QC	Total
2027020	WG	0620MW16GW	2027020-21RE1	06/21/2020		Dissolved
2027020	WG	0620MW17GW	2027020-22RE1	06/18/2020		Total
2027020	WG	0620MW17GW	2027020-23RE1	06/18/2020		Dissolved
2027020	WG	0620MW27GW	2027020-24RE1	06/18/2020		Total
2027020	WG	0620MW27GW	2027020-25RE1	06/18/2020		Dissolved
2027020	WG	0620MW28GW	2027020-26RE1	06/18/2020		Total
2027020	WG	0620MW28GW	2027020-27RE1	06/18/2020		Dissolved
2027020	WG	0620MW40GW	2027020-28RE1	06/19/2020		Total

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Work Order	Matrix	Sample ID	Lab ID	Sample Date	QC	Comment
2027020	WG	0620MW40GW	2027020-29RE1	06/19/2020		Dissolved
2027020	WG	0620MW42GW	2027020-30RE1	06/18/2020		Total
2027020	WG	0620MW42GW	2027020-31RE1	06/18/2020		Dissolved
2027020	WG	0620MW43GW	2027020-32RE1	06/23/2020		Total
2027020	WG	0620MW43GW	2027020-33RE1	06/23/2020		Dissolved
2027020	WG	0620MW44GW	2027020-34RE1	06/19/2020		Total
2027020	WG	0620MW44GW	2027020-35RE1	06/19/2020		Dissolved
2027020	WG	0620MW45GW	2027020-36RE1	06/19/2020		Total
2027020	WG	0620MW45GW	2027020-37	06/19/2020		Dissolved
2027020	WG	0620MW46GW	2027020-38RE1	06/21/2020	MS/MSD	Total
2027020	WG	0620MW46GW	2027020-39	06/21/2020	MS/MSD	Dissolved
2027020	WG	0620MW47GW	2027020-40	06/20/2020		Total
2027020	WG	0620MW47GW	2027020-41RE1	06/20/2020		Dissolved
2027020	WG	0620MW48GW	2027020-42	06/21/2020		Total
2027020	WG	0620MW48GW	2027020-43	06/21/2020		Dissolved
2027020	WG	0620MW50GW	2027020-44	06/20/2020		Total
2027020	WG	0620MW50GW	2027020-45	06/20/2020		Dissolved
2027020	WG	0620MW51GW	2027020-46	06/19/2020		Total
2027020	WG	0620MW51GW	2027020-47	06/19/2020		Dissolved
2027020	WG	0620MW52GW	2027020-48	06/20/2020		Total
2027020	WG	0620MW52GW	2027020-49	06/20/2020		Dissolved
2027020	WG	0620MW53GW	2027020-50	06/20/2020		Total
2027020	WG	0620MW53GW	2027020-51	06/20/2020		Dissolved
2027020	WG	0620MW54GW	2027020-52	06/21/2020		Total
2027020	WG	0620MW54GW	2027020-53	06/21/2020		Dissolved
2027020	WG	0620MW55GW	2027020-54	06/21/2020		Total
2027020	WG	0620MW55GW	2027020-55	06/21/2020		Dissolved
2027020	WG	0620MW56GW	2027020-56	06/18/2020		Total
2027020	WG	0620MW56GW	2027020-57	06/18/2020		Dissolved
2027020	WG	0620MW57GW	2027020-58	06/20/2020		Total
2027020	WG	0620MW57GW	2027020-59	06/20/2020		Dissolved
2027020	WG	0620MW58GW	2027020-60	06/20/2020		Total
2027020	WG	0620MW58GW	2027020-61	06/20/2020		Dissolved
2027020	WG	0620MW59GW	2027020-62	06/22/2020		Total
2027020	WG	0620MW59GW	2027020-63	06/22/2020		Dissolved
2027020	SW	0620RD05SW	2027020-64	06/17/2020	Lab QC	Total
2027020	SW	0620RD05SW	2027020-65RE1	06/17/2020		Dissolved
2027020	SW	0620RD06SW	2027020-66	06/17/2020		Total
2027020	SW	0620RD06SW	2027020-67	06/17/2020		Dissolved
2027020	SW	0620RD08SW	2027020-68	06/17/2020		Total
2027020	SW	0620RD08SW	2027020-69	06/17/2020		Dissolved
2027020	SW	0620RD10SW	2027020-70	06/17/2020	MS/MSD	Total

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Work Order	Matrix	Sample ID	Lab ID	Sample Date	QC	Comment
2027020	SW	0620RD10SW	2027020-71	06/17/2020	MS/MSD	Dissolved
2027020	SW	0620RD15SW	2027020-72	06/17/2020		Total
2027020	SW	0620RD15SW	2027020-73	06/17/2020		Dissolved
2027020	SW	0620RD99SW	2027020-74	06/17/2020		Total
2027020	SW	0620RD99SW	2027020-75	06/17/2020		Dissolved
2027020	WH	0620RS01	2027020-76RE1	06/16/2020		
2027020	WH	0620RS02	2027020-04RE1	06/22/2020		

SDG	Matrix	Test Method	Number of Samples	Sample Type
2027020	W	EPA 1631 – Low-Level Mercury	33	N/FD
2027020	W	EPA 1631 – Dissolved Low-Level Mercury	33	N/FD
2027020	W	EPA 1631 – Low-Level Mercury	8	FB
2027020	W	EPA 1631 – Low-Level Mercury	1	EB
2027020	W	EPA 1631 – Low-Level Mercury	2	RB

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	Yes.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Thermal preservation of the samples is not required per the method.
Frequency of Field QC Samples Correct? Field Duplicate - 1/20 samples MS/MSD - 1/20 samples Equipment Blank - 1/ set of samples per day?	<ul style="list-style-type: none"> - Three field duplicates for total and dissolved portions were collected for 24 groundwater samples. - One field duplicate was collected for total and dissolved portions for 5 surface water samples. - Three MS/MSD was collected 33 aqueous samples. - One equipment blank was collected on dedicated field filters. - Eight field blanks were collected in the field. - Two pre-mob rinsate blank for new well caps and freeze protection lines.
Case narrative present and complete?	Yes.
Any holding time violations?	No.

The following tables are presented at the end of this DUSR and provide summaries of results outside QC criteria:

- Method Blanks Results (Table 2, 2A, and 2B)
- MS/MSD Outside Limits (Table 3 and 3A)
- LCS Outside Limits (Table 4)
- Reanalysis Results (Table 5)
- Field Duplicate Results (Table 6)

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Mercury by EPA Method 1631	
Description	Notes and Qualifiers
Any compounds present in method, trip, or field blanks (see Table 2)?	Mercury was detected in field blank 0620FB02.
For samples, if results are < 5 times the blank, then "U" flag data (see Tables 2A and 2B).	Samples associated with field blank 0620FB02 were greater than 5X the blank detection. No qualifications were made.
Is Laboratory QC frequency at least one blank, standard reference material (SRM) and MS/MSD with each batch?	Yes.
Is MS/MSD within QC criteria (see Table 3 and 3A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Yes.
Is SRM within QC criteria (see Table 4)?	Yes.
Are the initial calibration standards recovered between 90-110?	Yes.
Spot check ICV 85-115%.	The ICVs were acceptable. Initial calibration verification standards associated with sequence batch 2000909 (ICV1 and ICV2) were slightly above the acceptance criteria. The ICVs were re-analyzed as ICV3 and ICV4 and the re-analysis of the ICVs passed within the accepted criteria and were reported. ICV1 and ICV2 were set to non-reportable.
Spot check CCV 77-123%.	CCVs 2000909-CCVG and 2000909-CCVH were recovered above the acceptance criteria. Samples and QC samples bracketed by these CCVs were reanalyzed and reported in later sequences. No qualifications were made.
Spot check ICB/CCB detections.	Yes. Mercury was detected in multiple CCBs below the MDL values. No qualifications were made.
Were any samples reanalyzed or diluted (see Table 5)? For any sample reanalysis or dilutions, is only one reportable result flagged?	Samples 0620MW47GW and 0620RS01 yielded results below the MRL. The sample was reanalyzed and reported detectable using larger aliquots. The re-analysis was reported. Multiple samples were diluted as noted in Table 5 and no justification was given by laboratory in the case narrative. Samples yielding results above the calibration standard is suspected.
Do field duplicate results show good precision for all compounds (see Table 6)?	Yes.

Summary of Potential Impacts on Data Usability Concerns
<ul style="list-style-type: none"> No data usability concerns.

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Table 2 – List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qualifier	Units	MDL	PQL
1631E	0620FB02	FB	Mercury	0.14	J	ng/L	0.13	0.40

Table 2A – List of Samples Qualified for Method Blank Contamination

None

Table 2B – List of Samples Qualified for Field Blank Contamination

Method	Field Blank	Matrix	Analyte	Blank Result	Sample Result*	Lab Qualifier	PQL	Affected Samples	Sample Flag
1631E	0620FB02	FB	Mercury	0.14	42.9/5.45		2.04	0620RD05SW	None
1631E	0620FB02	FB	Mercury	0.14	550/26.7		2.04	0620RD06SW	None
1631E	0620FB02	FB	Mercury	0.14	462/52.3		2.04	0620RD08SW	None
1631E	0620FB02	FB	Mercury	0.14	4.89/3.13		2.04	0620RD10SW	None
1631E	0620FB02	FB	Mercury	0.14	448/16.7		2.04	0620RD15SW	None
1631E	0620FB02	FB	Mercury	0.14	511/16.0		2.04	0620RD99SW	None

*The results for total and dissolved mercury are provided under the “Sample Result” column.

Table 3 – List of MS/MSD Recoveries outside Control Limits

None

Table 3A – List of RPDs outside Control Limits

None

Table 4 – List of SRM Recoveries outside Control Limits

None

Table 5 – Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
0620MW06GW	2027020-10	1631E (Total)	N	3X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW100GW	2027020-12	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW100GW	2027020-13	1631	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.

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Sample ID	Lab ID	Method	Sample Type	Action
0620MW101GW	2027020-14	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW101GW	2027020-15	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW102GW	2027020-16	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW102GW	2027020-17	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW10GW	2027020-18	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW10GW	2027020-19	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW16GW	2027020-20	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW16GW	2027020-21RE1	1631E (Dissolved)	N	26X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW17GW	2027020-22RE1	1631E (Total)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW17GW	2027020-23RE1	1631E (Dissolved)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW27GW	2027020-24RE1	1631E (Total)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW27GW	2027020-25RE1	1631E (Dissolved)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW28GW	2027020-26RE1	1631E (Total)	N	26X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW28GW	2027020-27RE1	1631E (Dissolved)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW42GW	2027020-30RE1	1631E (Total)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW45GW	2027020-36RE1	1631E (Total)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW45GW	2027020-37	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW46GW	2027020-38RE1	1631E (Total)	N	5X: Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 19, 2020	Completed by: Eridania Marte

Sample ID	Lab ID	Method	Sample Type	Action
0620MW46GW	2027020-39	1631E (Dissolved)	N	3X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW47GW	2027020-40	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW48GW	2027020-42	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW48GW	2027020-43	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW50GW	2027020-44	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW50GW	2027020-45	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW51GW	2027020-46	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW51GW	2027020-47	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW52GW	2027020-48	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW52GW	2027020-49	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW53GW	2027020-50	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW53GW	2027020-51	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW54GW	2027020-52	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW55GW	2027020-54	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW55GW	2027020-55	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW56GW	2027020-56	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW57GW	2027020-58	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620MW57GW	2027020-59	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.

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Sample ID	Lab ID	Method	Sample Type	Action
0620MW59GW	2027020-62	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD05SW	2027020-64	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD05SW	2027020-65RE1	1631E (Dissolved)	N	3X: Sample was re-analyzed due to CCV being above the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000929.
0620RD06SW	2027020-66	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD06SW	2027020-67	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD08SW	2027020-68	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD08SW	2027020-69	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD10SW	2027020-70	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD10SW	2027020-71	1631E (Dissolved)	N	3X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD15SW	2027020-72	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD15SW	2027020-73	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD99SW	2027020-74	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620RD99SW	2027020-75	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0620FB07	2027020-02RE1	1631E (Total)	N	Sample was re-analyzed due to CCV being above the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000929.
0620FB08	2027020-03RE1	1631E (Total)	N	Sample was re-analyzed due to CCV being above the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000929.
0620MW40GW	2027020-28RE1	1631E (Total)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW40GW	2027020-29RE1	1631E (Dissolved)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW42GW	2027020-31RE1	1631E (Dissolved)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.

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Date Completed: November 19, 2020	Completed by: Eridania Marte

Sample ID	Lab ID	Method	Sample Type	Action
0620MW43GW	2027020-32RE1	1631E (Total)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW43GW	2027020-33RE1	1631E (Dissolved)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW44GW	2027020-34RE1	1631E (Total)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW44GW	2027020-35RE1	1631E (Dissolved)	N	Sample was re-analyzed due to MSD being outside of the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000921.
0620MW47GW	2027020-41RE1	1631E (Dissolved)	N	Sample yielded results below the reporting limit and were re-analyzed using larger aliquots.
0620RS01	2027020-76RE1	1631E (Total)	N	Sample yielded results below the reporting limit and were re-analyzed using larger aliquots.
0620RS02	2027020-04RE1	1631E (Total)	N	Sample was re-analyzed due to CCV being above the acceptance criteria. The sample and its QC set was re-analyzed in sequence 2000929.

Table 6 – Summary of Field Duplicate Results

Method	Analyte	Unit	Matrix	PQL	Anal Type	0620MW55GW	0620MW102GW	RPD	RPD Rating	Sample Qual
1631E	Mercury, Total	ng/l	WG	2.04	A	92.5	96.7	4.4%	Good	None
1631E	Mercury, Dissolved	ng/l	WG	2.04	A	45.1	52.3	14.8%	Good	None

Method	Analyte	Unit	Matrix	PQL	Anal Type	0620MW52GW	0620MW100GW	RPD	RPD Rating	Sample Qual
1631E	Mercury, Total	ng/l	WG	2.04	A	41.7	28.6	37.3%	Good	None
1631E	Mercury, Dissolved	ng/l	WG	2.04	A	7.23	8.21	12.7%	Good	None

Method	Analyte	Unit	Matrix	PQL	Anal Type	0620MW48GW	0620MW101GW	RPD	RPD Rating	Sample Qual
1631E	Mercury, Total	ng/l	WG	2.04	A	8.98	9.81	8.8%	Good	None
1631E	Mercury, Dissolved	ng/l	WG	2.04	A	4.79	5.23	8.8%	Good	None

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 19, 2020	Completed by: Eridania Marte

Method	Analyte	Unit	Matrix	PQL	Anal Type	0620RD15SW	0620RD99SW	RPD	RPD Rating	Sample Qual
1631E	Mercury, Total	ng/l	SW	2.04	A	448	511	13.1%	Good	None
1631E	Mercury, Dissolved	ng/l	SW	2.04	A	16.7	16	4.3%	Good	None

Acronym List and Table Key:

- CCB = continuing calibration blank
- CCV = continuing calibration verification
- COC = chain of custody
- DUSR = data usability summary report
- EB = equipment blank
- FB = field blank
- FD = field duplicate
- ICB = initial calibration blank
- ICV = initial calibration verification
- LR = laboratory replicate
- MB = method blank
- MS = matrix spike
- MSD = matrix spike duplicate
- N = normal sample
- ND = not detected
- QA = quality assurance
- QAPP = quality assurance project plan
- QC = quality control
- RB = rinsate blank
- RPD = relative percent difference
- SDG = sample delivery group

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness based on applicable sections of the following guidelines.

- *Final Quality Assurance Project Plan, Baseline Monitoring, Red Devil mine, Alaska. May 2019.*
- *National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001, January 2017.*

Specific criteria for QC limits were obtained from the site specific QAPP. Compliance with the project QA program is indicated in the checklist and tables below. Any major or minor concerns affecting data usability are listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Laboratory	Sample Delivery Group	Project Code
Test America, Seattle	580-96725-1	1001095.0026.06

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	QC	ID Corrections
580-96725-1	WH	0820RS01	580-96725-1	8/11/2020 19:00	DUP MS/MSD		

SDG	Matrix	Test Method	Number of Samples	Sample Type
580-96725-1	WH	6020A – Metals ICP/MS	1	N
580-96725-1	WH	7470A – Mercury	1	N
580-96725-1	WH	7470A – Mercury	1	LR
580-96725-1	WH	7470A – Mercury	1	MS/MSD
580-96725-1	WH	353.2 - Nitrogen, Nitrate-Nitrite	1	N
580-96725-1	WH	353.2 - Nitrogen, Nitrate-Nitrite	1	LR
580-96725-1	WH	353.2 - Nitrogen, Nitrate-Nitrite	1	MS/MSD
580-96725-1	WH	SM2320B – Alkalinity	1	N
580-96725-1	WH	SM2540D – Total Suspended Solids (TSS)	1	N
580-96725-1	WH	SM2540D – Total Suspended Solids (TSS)	1	LR

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	Yes.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Yes.
Frequency of Field QC Samples Correct? Field Duplicate - 1/10 regular samples for each matrix and sampling method and/or type of equipment used. MS/MSD - 1/20 samples for each matrix and each sampling event. Equipment Blank - 1/20 field samples for each collection/decontamination method, by matrix and by sample type.	This sample is a pre-mob rinsate blank for new well caps and freeze protection lines. No field QC required.
Case narrative present and complete?	Yes.
Any holding time violations?	No.

The following tables are presented at the end of this DUSR and provide summaries of results outside QC criteria:

- Method Blanks Results (Table 2, 2A, and 2B)
- Surrogates Outside Limits (Table 3)
- MS/MSD Outside Limits (Table 4 and 4A)
- LCS Outside Limits (Table 5 and 5A)
- Serial Dilution Outside Limits (Table 6)
- Reanalysis Results (Table 7)
- Field Duplicate Results (Table 8)

Go to List

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

Metals by Method SW-846 6020B	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Unable to determine if a MS/MSD was analyzed with batch 335874; however, a LCS/LCSD was prepared with the prep batch.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	N/A
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ? Minimum 5-point linearity.	Yes.
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	Unable to be determined from report.
Are serial dilutions within QC criteria (see Table 6)?	N/A
Spot check ICS recoveries 80-120%.	The ICSs were within acceptance criteria.
Spot check ICV 90-110% and < 20% RSD.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 50-150%.	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Table 2A and 2B).	No ICB/CCB detections.
Spot check the internal standards – must be 30-120% of the intensity of the calibration blank.	Not applicable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Mercury by Method SW-846 7470A	
Description	Notes and Qualifiers
Any compounds present in method or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is Laboratory QC frequency at least one blank, LCS and MS/MSD with each batch?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Yes.
Is LCS within QC criteria (see Table 5)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ?	Yes.
Spot check ICV 90-110%.	The ICVs were acceptable.
Spot check CCV 80-120%.	The CCVs were acceptable.
Spot check ICB/CCB detections (see Table 2A and 2B).	No ICB/CCB detections.

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

Mercury by Method SW-846 7470A	
Description	
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Alkalinity by Standard Method 2320B	
Description	Notes and Qualifiers
Are any compounds present in method and/or field blanks as noted on Table 2?	Method blanks are not applicable to this technique.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	N/A
Is laboratory QC frequency at least one LCS and duplicate with each batch of up to 20 samples?	Yes.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration verification within QC limits?	Yes.
Is continuing calibration within QC limits?	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Nitrate/Nitrite by EPA Method 353.2	
Description	Notes and Qualifiers
Any compounds present in method, continuing calibration, and/or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Yes.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

Total Suspended Solids by Standard Method 2540D	
Description	Notes and Qualifiers
Are any compounds present in method blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch of 20 or fewer samples and one laboratory duplicate per 10 samples?	Yes.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	N/A

Summary of Potential Impacts on Data Usability Concerns
<ul style="list-style-type: none"> • There are no issues that impact data usability.

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

Table 2 – List of Positive Results for Blank Samples

None

Table 2A – List of Samples Qualified for Method Blank Contamination

None

Table 2B – List of Samples Qualified for Field Blank Contamination

N/A

Table 3 – List of Samples with Surrogates outside Control Limits

N/A

Table 4 – List of MS/MSD Recoveries outside Control Limits

None

Table 4A – List of RPDs outside Control Limits

None

Table 5 – List of LCS Recoveries outside Control Limits

None

Table 5A – List of RPDs outside Control Limits

None

Table 6 – List of Serial Dilution Recoveries outside Control Limits

None

Table 7 – Samples that were Re-analyzed

None

Table 8 – Summary of Field Duplicate Results

N/A

Acronym List and Table Key:

- CCB = continuing calibration blank
- CCV = continuing calibration verification
- CCVL = reporting limit continuing calibration verification
- COC = chain of custody

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 02, 2020	Completed by: Lynne Parker

Acronym List and Table Key:

CRDL	=	contract required detection limits
DRO	=	diesel range organics
DUSR	=	data usability summary report
FD	=	field duplicate
GRO	=	gasoline range organics
ICB	=	initial calibration blank
ICS	=	interference check standard
ICV	=	initial calibration verification
ICVL	=	reporting limit initial calibration verification
LCS	=	laboratory control sample
LCSD	=	laboratory control sample duplicate
LR	=	laboratory replicate
MB	=	method blank
MS	=	matrix spike
MSD	=	matrix spike duplicate
N	=	normal sample
ND	=	not detected
PDS	=	post-digestion spike
PQL	=	practical quantitation limit
QA	=	quality assurance
QAPP	=	quality assurance project plan
QC	=	quality control
RB	=	rinsate blank
RL	=	reporting limit
RPD	=	relative percent difference
RSD	=	relative standard deviation
SDG	=	sample delivery group
TSS	=	total suspended solids

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 04, 2020	Completed by: Lynne Parker

The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness based on applicable sections of the following guidelines.

- *Final Quality Assurance Project Plan, Baseline Monitoring, Red Devil mine, Alaska. May 2019.*
- *National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001, January 2017.*

Specific criteria for QC limits were obtained from the site specific QAPP. Compliance with the project QA program is indicated in the checklist and tables below. Any major or minor concerns affecting data usability are listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Laboratory	Sample Delivery Group	Project Code
Test America, Seattle	580-97343-1	1001095.0026.06

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	QC	ID Correct-ions
580-97343-1	WG	0920MW06GW	580-97343-1	9/4/2020 13:18			
580-97343-1	WG	0920MW100GW	580-97343-2	9/4/2020 15:30			
580-97343-1	WG	0920MW101GW	580-97343-3	9/5/2020 19:10			
580-97343-1	WG	0920MW10GW	580-97343-4	9/3/2020 14:30			
580-97343-1	WG	0920MW16GW	580-97343-5	9/3/2020 17:25			
580-97343-1	WG	0920MW17GW	580-97343-6	9/3/2020 16:13			
580-97343-1	WG	0920MW27GW	580-97343-7	9/4/2020 13:45			
580-97343-1	WG	0920MW28GW	580-97343-8	9/4/2020 15:30		MS/MS D/DUP	
580-97343-1	WG	0920MW40GW	580-97343-9	9/4/2020 19:15			
580-97343-1	WG	0920MW42GW	580-97343-10	9/7/2020 18:14			
580-97343-1	WG	0920MW43GW	580-97343-11	9/5/2020 14:05			
580-97343-1	WG	0920MW44GW	580-97343-12	9/6/2020 18:15			
580-97343-1	WG	0920MW45GW	580-97343-13	9/6/2020 14:51			
580-97343-1	WG	0920MW46GW	580-97343-14	9/6/2020 13:15			
580-97343-1	WG	0920MW47GW	580-97343-15	9/6/2020 11:48			
580-97343-1	WG	0920MW48GW	580-97343-16	9/3/2020 13:57		MS/MS D/DUP	
580-97343-1	WG	0920MW50GW	580-97343-17	9/6/2020 19:00	MS/MSD/ DUP		
580-97343-1	WG	0920MW51GW	580-97343-18	9/7/2020 14:35			
580-97343-1	WG	0920MW52GW	580-97343-19	9/6/2020 12:47			
580-97343-1	WG	0920MW53GW	580-97343-20	9/6/2020 19:29	MS/ MSD		
580-97343-1	WG	0920MW54GW	580-97343-21	9/7/2020 19:10	DUP		
580-97343-1	WG	0920MW55GW	580-97343-22	9/4/2020 15:07			
580-97343-1	WG	0920MW56GW	580-97343-23	9/6/2020 15:43	DUP		
580-97343-1	WG	0920MW57GW	580-97343-24	9/5/2020 19:10			
580-97343-1	WG	0920MW58GW	580-97343-25	9/7/2020 15:20			

Data Usability Summary Report	Project: Red Devil Mine: Baseline Monitoring
Date Completed: November 04, 2020	Completed by: Lynne Parker

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	QC	ID Correct -ions
580-97343-1	WG	0920MW59GW	580-97343-26	9/5/2020 17:07			
580-97343-1	WG	0920MW99GW	580-97343-27	9/3/2020 15:30			
580-97343-1	SW	0920DR05SW	580-97343-28	9/2/2020 13:47	MS//MSD /DUP		0920RD0 5SW
580-97343-1	SW	0920DR06SW	580-97343-29	9/2/2020 12:57	DUP		0920RD0 6SW
580-97343-1	SW	0920DR08SW	580-97343-30	9/2/2020 11:35			0920RD0 8SW
580-97343-1	SW	0920RD10SW	580-97343-31	9/2/2020 15:45			
580-97343-1	SW	0920RD15SW	580-97343-32	9/2/2020 14:30		MS/MS D/DUP	
580-97343-1	SW	0920RD99SW	580-97343-33	9/2/2020 15:45			

SDG	Matrix	Test Method	Number of Samples	Sample Type
580-97343-1	W	6010C – Metals ICP (Al, Ca, Fe, Mg, K, Na)	33	N
580-97343-1	W	6010C – Metals ICP (Al, Ca, Fe, Mg, K, Na)	4	FD
580-97343-1	W	6010C – Metals ICP (Al, Ca, Fe, Mg, K, Na)	3	DUP
580-97343-1	W	6010C – Metals ICP (Al, Ca, Fe, Mg, K, Na)	3	MS/MSD
580-97343-1	W	6010C – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	6	N
580-97343-1	W	6010C – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	4	FD
580-97343-1	W	6010C – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	1	DUP
580-97343-1	W	6010C – Metals ICP Dissolved (Al, Ca, Fe, Mg, K, Na)	1	MS/MSD
580-97343-1	W	6020A – Metals ICP/MS	33	N
580-97343-1	W	6020A – Metals ICP/MS	4	FD
580-97343-1	W	6020A – Metals ICP/MS	3	DUP
580-97343-1	W	6020A – Metals ICP/MS	3	MS/MSD
580-97343-1	W	6020A – Metals ICP/MS Dissolved	6	N
580-97343-1	W	6020A – Metals ICP/MS Dissolved	4	FD
580-97343-1	W	6020A – Metals ICP/MS Dissolved	1	DUP
580-97343-1	W	6020A – Metals ICP/MS Dissolved	1	MS/MSD
580-97343-1	W	7470A – Mercury	33	N
580-97343-1	W	7470A – Mercury	4	FD
580-97343-1	W	7470A – Mercury	3	DUP
580-97343-1	W	7470A – Mercury	3	MS/MSD
580-97343-1	W	7470A – Mercury, Dissolved	6	N
580-97343-1	W	7470A – Mercury, Dissolved	4	FD
580-97343-1	W	7470A – Mercury, Dissolved	1	DUP
580-97343-1	W	7470A – Mercury, Dissolved	1	MS/MSD
580-97343-1	W	353.2 - Nitrogen, Nitrate-Nitrite	33	N
580-97343-1	W	353.2 - Nitrogen, Nitrate-Nitrite	4	FD
580-97343-1	W	353.2 - Nitrogen, Nitrate-Nitrite	1	DUP
580-97343-1	W	353.2 - Nitrogen, Nitrate-Nitrite	4	MS/MSD

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SDG	Matrix	Test Method	Number of Samples	Sample Type
580-97343-1	W	SM2320B – Alkalinity	33	N
580-97343-1	W	SM2320B – Alkalinity	4	FD
580-97343-1	W	SM2320B – Alkalinity	3	DUP
580-97343-1	W	SM2540D – Total Suspended Solids (TSS)	33	N
580-97343-1	W	SM2540D – Total Suspended Solids (TSS)	4	FD
580-97343-1	W	SM2540D – Total Suspended Solids (TSS)	2	DUP
580-97343-1	W	SM2540C – Total Dissolved Solids (TDS)	6	N
580-97343-1	W	SM2540C – Total Dissolved Solids (TDS)	4	FD
580-97343-1	W	SM2540C – Total Dissolved Solids (TDS)	1	DUP
580-97343-1	W	9060C Organic Carbon, Total (TOC)	6	N
580-97343-1	W	9060C Organic Carbon, Total (TOC)	4	FD
580-97343-1	W	9060C Organic Carbon, Total (TOC)	1	DUP
580-97343-1	W	9060C Organic Carbon, Total (TOC)	1	MS/MSD

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	Yes. Sample names for 0920DR05SW, 0920DR06SW, and 0920DR08SW nomenclature was corrected in EDD to reflect COC. ID correction noted in Table 1.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Yes. The COC did not record the time of sample collection. The laboratory logged in the samples with the time noted on the container label.
Frequency of Field QC Samples Correct? Field Duplicate - 1/10 regular samples for each matrix and sampling method and/or type of equipment used. MS/MSD - 1/20 samples for each matrix and each sampling event. Equipment Blank - 1/20 field samples for each collection/decontamination method, by matrix and by sample type.	Four field duplicates were collected. Three MS/MSDs were collected. An equipment blank was not included in this SDG. The frequency of field QC samples will be evaluated for overall samples collected.
Case narrative present and complete?	Yes.
Any holding time violations?	No.

The following tables are presented at the end of this DUSR and provide summaries of results outside QC criteria:

- Method Blanks Results (Table 2, 2A, and 2B)
- Surrogates Outside Limits (Table 3)
- MS/MSD Outside Limits (Table 4 and 4A)
- LCS Outside Limits (Table 5 and 5A)
- Serial Dilution Outside Limits (Table 6)
- Reanalysis Results (Table 7)
- Field Duplicate Results (Table 8)

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Metals by Method SW-846 6010C	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	Yes. Aluminum, iron, magnesium, potassium, and sodium exhibited high recoveries in the post digestion spike of 580-97343-8. The MS and MSDs were compliant; therefore, no qualification is required. Iron and magnesium exhibited high recoveries in the post digestion spike of 580-97343-32. The MS and MSDs were compliant; therefore, no qualification is required.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.998 and RSD between multiple exposures $\leq 5\%$? Minimum 4-point linearity.	Yes.
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	Yes.
Are serial dilutions within QC criteria (see Table 6)?	Yes.
Spot check ICS recoveries 80-120%.	Sodium was detected above the MDL in ISCA 580-338376/10 and 580-338164/10, and potassium was detected above the MDL in ISCA 580-338164/10. The possibility of a false positive exists. The associated blanks were non-detect for the analytes; therefore, no qualification of the data was made for this issue.
Spot check ICV 90-110%.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 70-130%	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Table 2A and 2B).	Aluminum was detected in CCB 580-338164/36. The associated sample result was greater than 5X the blank detection; therefore, no qualification was required.
Spot check the internal standard recoveries 50-150%.	The internal standards were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

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Metals by Method SW-846 6020B	
Description	Notes and Qualifiers
Are any compounds present in method and field blanks as noted on Table 2?	Yes. Vanadium was detected at a concentration less than the PQL in method blank 580-338201/14-A.
For samples, if results are < 5 times the blank then "U" flag data (see Table 2A and 2B).	The dissolved vanadium results in samples 0920DR05SW, 0920DR06SW, 0920DR08SW, 0920RD10SW, 0920RD15SW, and 0920RD099SW were U qualified as non-detect.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Are MS/MSD within QC criteria (see Table 4 and 4A)? QC limits are not applicable to sample results greater than 4 times spike amount.	Yes.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ? Minimum 5-point linearity.	Yes.
Is there one serial dilution per 20 samples? Flag all data reported with an "E" as "J".	
Are serial dilutions within QC criteria (see Table 6)?	The total and dissolved antimony results in sample 0920RD15SW were J qualified as estimated due to serial dilutions greater than 15%.
Spot check ICS recoveries 80-120%.	The ICSs were within acceptance criteria.
Spot check ICV 90-110% and < 20% RSD.	The ICVs were within acceptance criteria.
Spot check CCV 90-110%.	The CCVs were within acceptance criteria.
Spot check ICVL/CCVL 50-150%.	The ICVL/CCVLs were within acceptance criteria.
Spot check ICB/CCB detections (see Tables 2 and 2A).	Antimony was detected in eleven CCB, and vanadium was detected in one CCB. The total antimony results in samples 0920MW55GW, 0920RD10SW, and 0920RD99SW were U qualified as non-detect. The dissolved antimony results in samples 0920DR05SW, 0920RD10SW, and 0920RD99SW were U qualified as non-detect.
Spot check the internal standards – must be 30-120% of the intensity of the calibration blank.	N/A
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Mercury by Method SW-846 7470A	
Description	
Any compounds present in method or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is Laboratory QC frequency at least one blank, LCS and MS/MSD with each batch?	Yes.

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Mercury by Method SW-846 7470A	
Description	
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	No. Mercury was recovered high in the MS of sample 0920NW28GW. The result was J qualified as estimated.
Is LCS within QC criteria (see Table 5)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration ≥ 0.995 ?	Yes.
Spot check ICV 90-110%.	The ICVs were acceptable.
Spot check CCV 80-120%.	The CCVs were acceptable.
Spot check ICB/CCB detections (see Table 2A and 2B).	The CCBs were acceptable.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Alkalinity by Standard Method 2320B	
Description	Notes and Qualifiers
Are any compounds present in method and/or field blanks as noted on Table 2?	Method blanks are not applicable to this technique.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	N/A
Is laboratory QC frequency at least one LCS and duplicate with each batch of up to 20 samples?	Yes.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration verification within QC limits?	Yes.
Is continuing calibration within QC limits?	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Anions by EPA Method 300.0	
Description	Notes and Qualifiers
Are any compounds present in method blanks, continuing calibration blanks (CCB), and/or field blanks?	Chloride was detected at a concentration less than the PQL in method blanks 580-338349/29 and 580-339021/11. Chloride was also detected in eight of the associated CCBs.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	The chloride results in samples 0920MW17GW, 0920MW28GW, 0920MW48GW, 0920MW55GW, 0920RD08SW, 0920RD10SW, 0920RD15SW, and 0920RD99SW were U qualified as non-detect.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	A MS/MSD was not prepared with batch 339178, but an LCS/LCSD was analyzed.
Are MS/MSD within QC criteria? QC limits are not applicable to sample results greater than 4 times spike amount. (see Table 4 and 4A)	Chloride was recovered high in the MS and MSD of 0920MW28GW. The sample results were U qualified due to blank contamination; therefore,

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Anions by EPA Method 300.0	
Description	Notes and Qualifiers
	the results were UJ qualified as estimated non-detect. Sulfate was recovered high in the MS and MSD of 0920MW28GW and 0920MW48GW. The sample results were J qualified as estimated.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 6)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 7)?	Yes.

Nitrate/Nitrite by EPA Method 353.2	
Description	Notes and Qualifiers
Any compounds present in method, continuing calibration, and/or field blanks (see Table 2)?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Nitrate-nitrite was recovered low in samples 0920MW28GW, 0920MW48GW, and 0920MW50GW. The analyte was UJ qualified as estimated non-detect in samples 0920MW28GW and 0920MW50GW, and J qualified as estimated in sample 0920MW48GW.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Total Organic Carbon by SW-846 9060A	
Description	Notes and Qualifiers
Any compounds present in method, continuing calibration, and/or field blanks (see Table 2)?	Yes. TOC was detected in CCBs 580-338140/47 580-338140/54.

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Total Organic Carbon by SW-846 9060A	
Description	Notes and Qualifiers
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	The sample results in 0920RD05SW, 0920RD15SW, and 0920RD99SW were U qualified as non-detect.
Is laboratory QC frequency one blank and LCS with each batch and one set of MS/MSD per 20 samples?	Yes.
Is MS/MSD within QC criteria (see Table 4 and 4A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Yes.
Is LCS/LCSD within QC criteria (see Table 5 and 5A)? If out, and the recovery is high with no positive values, then no data qualification is required.	Yes.
Is initial calibration for target compounds within QC limits? Is initial calibration verification within QC limits?	Yes.
Is continuing calibration verification for target compounds within QC limits?	Yes.
Were any samples reanalyzed or diluted (see Table 7)? For any sample reanalysis or dilutions, is only one reportable result flagged?	No.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Total Suspended Solids and Total Dissolved Solids by Standard Method 2540D/2540C	
Description	Notes and Qualifiers
Are any compounds present in method blanks as noted on Table 2?	No.
For samples, if results are < 5 times the blank, then "U" flag data (see Table 2A and 2B).	No qualification required.
Is laboratory QC frequency one blank and LCS with each batch of 20 or fewer samples and one laboratory duplicate per 10 samples?	A duplicate was not prepared with batch 337916 for TSS analysis.
Is LCS within QC criteria (see Table 5)? If out, and the recovery high with no positive values, then no data qualification is required.	Yes.
Are laboratory duplicates within QC limits?	Yes.
Do field duplicate results show good precision for all compounds (see Table 8)?	Yes.

Summary of Potential Impacts on Data Usability Concerns
<ul style="list-style-type: none"> • The TOC results in 0920RD05SW, 0920RD15SW, and 0920RD99SW were U qualified as non-detect due to positive detections in the associated CCBs. • Nitrate-nitrite was UJ qualified as estimated non-detect in samples 0920MW28GW and 0920MW50GW due to low MS/MSD recoveries. • Nitrate-nitrite was J qualified as estimated in sample 0920MW48GW due to low MS/MSD recoveries. • Chloride was UJ qualified as estimated non-detect in sample due to MS and MSD recoveries outside of control limits.

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Summary of Potential Impacts on Data Usability Concerns
<ul style="list-style-type: none"> • Sulfate was J qualified as estimated in samples 0920MW28GW and 0920MW48GW due to high MS/MSD recoveries. • The chloride results in samples 0920MW17GW, 0920MW28GW, 0920MW48GW, 0920MW55GW, 0920RD08SW, 0920RD10SW, 0920RD15SW, and 0920RD99SW were U qualified as non-detect due to method blank and CCB blank contamination. • Mercury was J qualified as estimated in sample 0920NW28GW due to high MS recovery. • The total antimony results in samples 0920MW55GW, 0920RD10SW, and 0920RD99SW were U qualified as non-detect due to blank detections in the CCB. • The dissolved antimony results in samples 0920DR05SW, 0920RD10SW, and 0920RD99SW were U qualified as non-detect due to blank detections in the CCB. • The total and dissolved antimony results in sample 0920RD15SW were J qualified as estimated due to serial dilutions greater than 15%. • The dissolved vanadium results in samples 0920DR05SW, 0920DR06SW, 0920DR08SW, 0920RD10SW, 0920RD15SW, and 0920RD099SW were U qualified as non-detect due to positive detections in the method blank.

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Table 2 – List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qualifier	Units	MDL	PQL
6010C	580-338164/36	CCB	Aluminum	0.117	J	mg/L	0.11	1.5
6020B	580-338141/47	CCB	Antimony	0.181	J	ug/L	0.11	0.80
6020B	580-338141/61	CCB	Antimony	0.169	J	ug/L	0.11	0.80
6020B	580-338141/74	CCB	Antimony	0.162	J	ug/L	0.11	0.80
6020B	580-338216/12	CCB	Antimony	0.133	J	ug/L	0.11	0.80
6020B	580-338216/25	CCB	Antimony	0.172	J	ug/L	0.11	0.80
6020B	580-338216/37	CCB	Antimony	0.124	J	ug/L	0.11	0.80
6020B	580-338216/50	CCB	Antimony	0.163	J	ug/L	0.11	0.80
6020B	580-338216/62	CCB	Antimony	0.160	J	ug/L	0.11	0.80
6020B	580-338351/40	CCB	Antimony	0.185	J	ug/L	0.11	0.80
6020B	580-338351/40	CCB	Vanadium	0.733	J	ug/L	0.456	4.0
6020B	580-338351/52	CCB	Antimony	0.233	J	ug/L	0.11	0.80
6020B	580-338351/60	CCB	Antimony	0.238	J	ug/L	0.11	0.80
6020B	580-338201/14-A	MB	Vanadium	0.00284	J	mg/L	0.00055	0.004
300.0	580-338349/2	CCB	Chloride	0.181	J	mg/L	0.14	0.9
300.0	580-338349/33	CCB	Chloride	0.184	J	mg/L	0.14	0.9
300.0	580-339021/10	CCB	Chloride	0.156	J	mg/L	0.14	0.9
300.0	580-339021/45	CCB	Chloride	0.185	J	mg/L	0.14	0.9
300.0	580-339021/8	CCB	Chloride	0.182	J	mg/L	0.14	0.9
300.0	580-339021/50	CCB	Chloride	0.184	J	mg/L	0.14	0.9
300.0	580-339178/30	CCB	Chloride	0.148	J	mg/L	0.14	0.9
300.0	580-339178/39	CCB	Chloride	0.146	J	mg/L	0.14	0.9
300.0	580-338349/29	MB	Chloride	0.184	J	mg/L	0.14	0.9
300.0	580-339021/11	MB	Chloride	0.149	J	mg/L	0.14	0.9
9060A	580-338140/47	CCB	Total Organic Carbon	0.569	J	mg/L	0.38	1.5
9060A	580-338140/54	CCB	Total Organic Carbon	1.03	J	mg/L	0.38	1.5

Table 2A – List of Samples Qualified for Method Blank Contamination

Method	Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qualifier	PQL	Affected Samples	Sample Flag
6010C	580-338164/36	WG	Aluminum	0.117	0.8	J	1.5	0920MW28GW	None

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Method	Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qualifier	PQL	Affected Samples	Sample Flag
6020B	580-338141/47 & 580-338141/61	WG	Antimony, Total	0.00181 0.00169	0.011		0.80	0920MW28GW	None
6020B	580-338216/12 & 580-338216/25	WG	Antimony, Total	0.00133 0.00172	ND		0.80	0920MW48GW	None
6020B	580-338216/12 & 580-338216/25	WG	Antimony, Total	0.00133 0.00172	0.0065		0.80	0920MW55GW	U Flag
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	ND		0.80	0920MW56GW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	ND		0.80	0920MW57GW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	ND		0.80	0920MW58GW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	ND		0.80	0920MW59GW	None
6020B	580-338216/37 & 580-338216/50	WG	Antimony, Total	0.00124 0.00163	ND		0.80	0920MW99GW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	0.025		0.80	0920DR05SW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	0.22		0.80	0920DR06SW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	0.28		0.80	0920DR08SW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	0.002	J	0.80	0920RD10SW	U Flag
6020B	580-338216/37 & 580-338216/50	WG	Antimony, Total	0.00124 0.00163	0.04		0.80	0920RD15SW	None
6020B	580-338216/50 & 580-338216/62	WG	Antimony, Total	0.00163 0.00160	0.0019	J	0.80	0920RD99SW	U Flag
6020B	580-338351/52 & 580-338351/60	WG	Antimony, Dissolved	0.00233 0.00238	0.0043		0.80	0920DR05SW	U Flag
6020B	580-338351/52 & 580-338351/60	WG	Antimony, Dissolved	0.00233 0.00238	0.23		0.80	0920DR06SW	None
6020B	580-338351/52 & 580-338351/60	WG	Antimony, Dissolved	0.00233 0.00238	0.28		0.80	0920DR08SW	None
6020B	580-338351/52 & 580-338351/60	WG	Antimony, Dissolved	0.00233 0.00238	0.0045		0.80	0920RD10SW	U Flag

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Method	Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qualifier	PQL	Affected Samples	Sample Flag
6020B	580-338351/40 & 580-338351/52	WG	Antimony, Dissolved	0.00185 0.00233	0.04		0.80	0920RD15SW	None
6020B	580-338351/40	WG	Vanadium, Dissolved	0.00733	0.0057	J B	0.004	0920RD15SW	U Flag
6020B	580-338351/52 & 580-338351/60	WG	Antimony, Dissolved	0.00233 0.00238	0.0026	J	0.80	0920RD99SW	U Flag
6020B	580-338201/14-A	WG	Vanadium, Dissolved	0.00284	0.0045	J B	0.004	0920DR05SW	U Flag
6020B	580-338201/14-A	WG	Vanadium, Dissolved	0.00284	0.0051	J B	0.004	0920DR06SW	U Flag
6020B	580-338201/14-A	WG	Vanadium, Dissolved	0.00284	0.0053	J B	0.004	0920DR08SW	U Flag
6020B	580-338201/14-A	WG	Vanadium, Dissolved	0.00284	0.0049	J B	0.004	0920RD10SW	U Flag
6020B	580-338201/14-A	WG	Vanadium, Dissolved	0.00284	0.0057	J B	0.004	0920RD15SW	U Flag
6020B	580-338201/14-A	WG	Vanadium, Dissolved	0.00284	0.0052	J B	0.004	0920RD99SW	U Flag
300.0	580-338349/2	WG	Chloride	0.181	1.2			0920MW06GW	None
300.0	580-338349/2	WG	Chloride	0.181	1.2			0920MW100GW	None
300.0	580-338349/2	WG	Chloride	0.181	1.2			0920MW101GW	None
300.0	580-338349/2	WG	Chloride	0.181	1.4			0920MW10GW	None
300.0	580-338349/2	WG	Chloride	0.181	1.3			0920MW16GW	None
300.0	580-339021/45 580-339021/8	WG	Chloride	0.185 0.182	0.81	J B		0920MW17GW	U Flag
300.0	580-338349/2	WG	Chloride	0.181	1.6			0920MW27GW	None
300.0	580-338349/2	WG	Chloride	0.181	0.76	J		0920MW28GW	U Flag
300.0	580-338349/2	WG	Chloride	0.181	1.1			0920MW40GW	None
300.0	580-339021/45 580-339021/8	WG	Chloride	0.185 0.182	0.81	J B		0920MW48GW	U Flag
300.0	580-339178/30	WG	Chloride	0.148	0.96			0920MW54GW	None
300.0	580-339178/30	WG	Chloride	0.148	0.74	J		0920MW55GW	U Flag
300.0	580-339178/30	WG	Chloride	0.148	0.96			0920MW56GW	None
300.0	580-339178/30	WG	Chloride	0.148	1.1			0920MW57GW	None
300.0	580-339178/30 580-339178/39	WG	Chloride	0.148 0.146	0.81	J		0920MW58GW	None
300.0	580-338349/33	WG	Chloride	0.184	1.2			0920MW59GW	None
300.0	580-338349/33	WG	Chloride	0.184	1.1			0920MW99GW	None
300.0	580-339178/30 580-339178/39	WG	Chloride	0.148 0.146	0.8	J		0920DR05SW	None
300.0	580-339178/30	WG	Chloride	0.148	0.78	J		0920DR06SW	None

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Method	Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qualifier	PQL	Affected Samples	Sample Flag
	580-339178/39			0.146					
300.0	580-339178/30 580-339178/39	WG	Chloride	0.148 0.146	0.71	J		0920RD08SW	U Flag
300.0	580-339178/30 580-339178/39	WG	Chloride	0.148 0.146	0.67	J		0920RD10SW	U Flag
300.0	580-339178/30 580-339178/39	WG	Chloride	0.148 0.146	0.71	J		0920RD15SW	U Flag
300.0	580-339178/30 580-339178/39	WG	Chloride	0.148 0.146	0.68	J		0920RD99SW	U Flag
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW06GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW100GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW101GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.4			0920MW10GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.3			0920MW16GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.6			0920MW27GW	None
300.0	580-338349/29	WG	Chloride	0.184	0.76	J		0920MW28GW	U Flag
300.0	580-338349/29	WG	Chloride	0.184	1.1			0920MW40GW	None
300.0	580-338349/29	WG	Chloride	0.184	0.97			0920MW42GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.1			0920MW43GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.4			0920MW44GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW45GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.1			0920MW46GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW47GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW50GW	None
300.0	580-338349/29	WG	Chloride	0.184	0.95			0920MW51GW	None
300.0	580-338349/29	WG	Chloride	0.184	0.99			0920MW52GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.3			0920MW53GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.2			0920MW59GW	None
300.0	580-338349/29	WG	Chloride	0.184	1.1			0920MW99GW	None
300.0	580-339021/11	WG	Chloride	0.149	0.81	J B		0920MW17GW	None
300.0	580-339021/11	WG	Chloride	0.149	0.81	J B		0920MW48GW	None
9060A	580-338140/47	WG	Total Organic Carbon	0.569	2.4		1.5	0920DR05SW	U Flag
9060A	580-338140/47	WG	Total Organic Carbon	0.569	3.3		1.5	0920DR06SW	None

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Method	Blank	Matrix	Analyte	Blank Result	Sample Result	Lab Qualifier	PQL	Affected Samples	Sample Flag
9060A	580-338140/47	WG	Total Organic Carbon	0.569	3.2		1.5	0920DR08SW	None
9060A	580-338140/47	WG	Total Organic Carbon	0.569	3.5		1.5	0920RD10SW	None
9060A	580-338140/47 580-338140/54	WG	Total Organic Carbon	0.569 1.03	3.7		1.5	0920RD15SW	U Flag
9060A	580-338140/47 580-338140/54	WG	Total Organic Carbon	0.569 1.03	3.9		1.5	0920RD99SW	U Flag

Table 2B – List of Samples Qualified for Field Blank Contamination

N/A

Table 3 – List of Samples with Surrogates outside Control Limits

None

Table 4 – List of MS/MSD Recoveries outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	MS	MSD	Low Limit	High Limit	Sample Qualifier
7470A	0920MW28GW	N	Mercury	0.00035	0.0020	124	115	80	120	J Flag
300.0	0920MW28GW	N	Chloride	0.76	50.0	113	113	90	110	UJ Flag
300.0	0920MW28GW	N	Sulfate	46	50.0	112	112	90	110	J Flag
300.0	0920MW48GW	N	Sulfate	4.0	50.0	112	111	90	110	J Flag
353.2	0920MW28GW	N	Nitrate Nitrite	ND	0.500	60	56	90	110	UJ Flag
353.2	0920MW48GW	N	Nitrate Nitrite	1.2	0.500	72	74	90	110	J Flag
353.2	0920MW50GW	N	Nitrate Nitrite	ND	0.500	80	83	90	110	UJ Flag

Table 4A – List of RPDs outside Control Limits

Method	Sample Type	Sample ID	Analyte	RPD	RPD Limit	Sample Qualifier
7470A	DUP	0920MW28GW	Mercury	76	20	<5X PQL
6020B	DUP	0920MW48GW	Chromium	143	20	<5X PQL

Table 5 – List of LCS Recoveries outside Control Limits

None

Table 5A – List of RPDs outside Control Limits

None

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Table 6 – List of Serial Dilution Recoveries outside Control Limits

Method	Sample ID	Analyte	Orig. Result	Serial Dilution Result	MDL	%D	Sample Qualifier
6020B	0920RD15SW	Antimony, Total	0.040	0.0456	0.00055	15	J Flag
6020B	0920RD15SW	Antimony, Dissolved	0.040	0.0472	0.00055	19	J Flag

Table 7 – Samples that were Re-analyzed
None.

Table 8 – Summary of Field Duplicate Results

Method	Analyte	Unit	Matrix	PQL	0920MW48GW	0920MW99GW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	Water	5	ND	1.1	NC		
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	Water	5	0.14	ND	NC		
SM 2320B	Carbonate Alkalinity as CaCO3	mg/L	Water	5	4	3.8	5.1%	Good	None
SM 2320B	Hydroxide Alkalinity as CaCO3	mg/L	Water	5	1.2	1.1	8.7%	Good	None
MCAWW 300.0	Chloride	mg/L	Water	0.9	110	100	9.5%	Good	None
MCAWW 300.0	Fluoride	mg/L	Water	0.2	110	100	9.5%	Good	None
SW846 6010D	Iron	mg/L	Water	0.5	20	20	0.0%	Good	None
SW846 6010D	Potassium	mg/L	Water	3.3	19	18	5.4%	Good	None
SW846 6010D	Sodium	mg/L	Water	2	0.44	0.42	4.7%	Good	None
SW846 6020B	Antimony	mg/L	Water	0.004	1.7	1.6	6.1%	Good	None
SW846 6020B	Beryllium	mg/L	Water	0.002	0.055	0.055	0.0%	Good	None
SW846 6020B	Cobalt	mg/L	Water	0.002	0.0073	ND	NC		
SW846 6020B	Nickel	mg/L	Water	0.015	0.012	0.009	28.6%	Poor	<5X PQL
SW846 6020B	Selenium	mg/L	Water	0.04	0.001	ND	NC		
SW846 6020B	Zinc	mg/L	Water	0.035	0.0033	0.004	19.2%	Good	None

Method	Analyte	Unit	Matrix	PQL	0920MW57GW	0920MW101GW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	Water	5	60	55	8.7%	Good	None
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	Water	5	60	55	8.7%	Good	None
SM 2320B	Carbonate Alkalinity as CaCO3	mg/L	Water	5	ND	ND	NC		

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SM 2320B	Hydroxide Alkalinity as CaCO3	mg/L	Water	5	ND	ND	NC		
MCAWW 300.0	Chloride	mg/L	Water	0.9	1.1	1.2	8.7%	Good	None
MCAWW 300.0	Fluoride	mg/L	Water	0.2	0.13	0.042	102.3%	Poor	<5X PQL
MCAWW 300.0	Sulfate	mg/L	Water	1.2	3.9	3.8	2.6%	Good	None
SW846 6010D	Calcium	mg/L	Water	1.1	14	14	0.0%	Good	None
SW846 6010D	Magnesium	mg/L	Water	1.1	8.6	8.7	1.2%	Good	None
SW846 6010D	Sodium	mg/L	Water	2	2.4	2.5	4.1%	Good	None
SW846 6020B	Arsenic	mg/L	Water	0.005	0.0013	0.0014	7.4%	Good	None
SW846 6020B	Barium	mg/L	Water	0.006	0.0082	0.0081	1.2%	Good	None
SW846 6020B	Chromium	mg/L	Water	0.004	0.0012	0.0013	8.0%	Good	None
SW846 6020B	Manganese	mg/L	Water	0.01	0.0051	0.011	73.3%	Poor	<5X PQL
SW846 6020B	Nickel	mg/L	Water	0.015	0.0024	0.0029	18.9%	Good	None
SW846 6020B	Vanadium	mg/L	Water	0.02	0.004	ND	NC		
MCAWW 353.2	Nitrate Nitrite as N	mg/L	Water	0.15	0.15	0.16	6.5%	Good	None

Method	Analyte	Unit	Matrix	PQL	0920RD10SW	0920RD99SW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	Water	5	85	79	7.3%	Good	None
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	Water	5	85	79	7.3%	Good	None
SM 2320B	Carbonate Alkalinity as CaCO3	mg/L	Water	5	ND	ND	NC		
SM 2320B	Hydroxide Alkalinity as CaCO3	mg/L	Water	5	ND	ND	NC		
MCAWW 300.0	Fluoride	mg/L	Water	0.2	0.1	0.096	4.1%	Good	None
MCAWW 300.0	Sulfate	mg/L	Water	1.2	9.6	10	4.1%	Good	None
SW846 6010D	Calcium	mg/L	Water	1.1	22	22	0.0%	Good	None
SW846 6010D	Magnesium	mg/L	Water	1.1	12	12	0.0%	Good	None
SW846 6010D	Sodium	mg/L	Water	2	1.8	1.9	5.4%	Good	None
SW846 6010D	Calcium	mg/L	Water	1.1	22	23	4.4%	Good	None
SW846 6010D	Magnesium	mg/L	Water	1.1	12	12	0.0%	Good	None
SW846 6010D	Sodium	mg/L	Water	2	2	2	0.0%	Good	None
SW846 6020B	Arsenic	mg/L	Water	0.005	0.0015	0.0016	6.5%	Good	None
SW846 6020B	Barium	mg/L	Water	0.006	0.027	0.027	0.0%	Good	None
SW846 6020B	Chromium	mg/L	Water	0.004	0.0015	ND	NC		
SW846 6020B	Manganese	mg/L	Water	0.01	0.012	0.014	15.4%	Good	None

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Method	Analyte	Unit	Matrix	PQL	0920RD10SW	0920RD99SW	RPD	RPD Rating	Sample Qual
SW846 6020B	Vanadium	mg/L	Water	0.02	0.0028	0.0029	3.5%	Good	None
SW846 6020B	Arsenic	mg/L	Water	0.005	0.002	0.0018	10.5%	Good	None
SW846 6020B	Barium	mg/L	Water	0.006	0.027	0.028	3.6%	Good	None
SW846 6020B	Manganese	mg/L	Water	0.01	0.0097	0.01	3.0%	Good	None
SW846 9060	Total Organic Carbon	mg/L	Water	1.5	3.5	ND	NC		
SM 2540C	Total Dissolved Solids	mg/L	Water	10	71	81	13.2%	Good	None

Method	Analyte	Unit	Matrix	PQL	0920MW28GW	0920MW100GW	RPD	RPD Rating	Sample Qual
SM 2320B	Alkalinity	mg/L	Water	5	190	190	0.0%	Good	None
SM 2320B	Bicarbonate Alkalinity as CaCO3	mg/L	Water	5	190	190	0.0%	Good	None
SM 2320B	Carbonate Alkalinity as CaCO3	mg/L	Water	5	ND	ND	NC		
SM 2320B	Hydroxide Alkalinity as CaCO3	mg/L	Water	5	ND	ND	NC		
MCAWW 300.0	Chloride	mg/L	Water	0.9	ND	1.2	NC		
MCAWW 300.0	Fluoride	mg/L	Water	0.2	ND	0.38	NC		
MCAWW 300.0	Sulfate	mg/L	Water	1.2	46	46	0.0%	Good	None
SW846 7470A	Mercury	mg/L	Water	3E-04	0.00035	0.001	96.3%	Poor	<5X PQL
SW846 6010D	Aluminum	mg/L	Water	1.5	0.8	0.94	16.1%	Good	None
SW846 6010D	Calcium	mg/L	Water	1.1	41	41	0.0%	Good	None
SW846 6010D	Iron	mg/L	Water	0.5	2.2	2.3	4.4%	Good	None
SW846 6010D	Magnesium	mg/L	Water	1.1	31	32	3.2%	Good	None
SW846 6010D	Potassium	mg/L	Water	3.3	1	1.1	9.5%	Good	None
SW846 6010D	Sodium	mg/L	Water	2	11	11	0.0%	Good	None
SW846 6020B	Antimony	mg/L	Water	0.004	0.011	0.012	8.7%	Good	None
SW846 6020B	Arsenic	mg/L	Water	0.005	0.13	0.13	0.0%	Good	None
SW846 6020B	Barium	mg/L	Water	0.006	0.063	0.066	4.7%	Good	None
SW846 6020B	Chromium	mg/L	Water	0.004	0.0024	0.0054	76.9%	Poor	<5X PQL
SW846 6020B	Cobalt	mg/L	Water	0.002	0.0032	0.0035	9.0%	Good	None
SW846 6020B	Manganese	mg/L	Water	0.01	0.85	0.88	3.5%	Good	None
SW846 6020B	Nickel	mg/L	Water	0.015	0.008	0.0088	9.5%	Good	None
SM 2540D	Total Suspended Solids	mg/L	Water	2	16	19	17.1%	Good	None

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Acronym List and Table Key:

CCB	=	continuing calibration blank
CCV	=	continuing calibration verification
CCVL	=	reporting limit continuing calibration verification
COC	=	chain of custody
CRDL	=	contract required detection limits
DRO	=	diesel range organics
DUSR	=	data usability summary report
FD	=	field duplicate
GRO	=	gasoline range organics
ICB	=	initial calibration blank
ICS	=	interference check standard
ICV	=	initial calibration verification
ICVL	=	reporting limit initial calibration verification
LCS	=	laboratory control sample
LCSD	=	laboratory control sample duplicate
LR	=	laboratory replicate
MB	=	method blank
MS	=	matrix spike
MSD	=	matrix spike duplicate
N	=	normal sample
ND	=	not detected
PDS	=	post-digestion spike
PQL	=	practical quantitation limit
QA	=	quality assurance
QAPP	=	quality assurance project plan
QC	=	quality control
RB	=	rinsate blank
RL	=	reporting limit
RPD	=	relative percent difference
RSD	=	relative standard deviation

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Acronym List and Table Key:

SDG = sample delivery group
TSS = total suspended solids

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The analytical data provided by the laboratory were reviewed for precision, accuracy, and completeness based on applicable sections of the following guidelines.

- *Final Quality Assurance Project Plan, Baseline Monitoring, Red Devil mine, Alaska. May 2019.*
- *National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-540-R-2017-001, January 2017.*

Specific criteria for QC limits were obtained from the site specific QAPP. Compliance with the project QA program is indicated in the checklist and tables below. Any major or minor concerns affecting data usability are listed below. The checklist and tables also indicate whether data qualification is required and/or the type of qualifier assigned.

Reference:

Laboratory	Sample Delivery Group	Project Code
Brooks Applied Labs	2037046 EEI-SE1802	1001095.0026.06

Work Order	Matrix	Sample ID	Lab ID	Sample Date	QC	Comment
2037046	WQ	0920EB01	2037046-01	09/07/2020		
2037046	WQ	0920FB01	2037046-02	09/02/2020		
2037046	WQ	0920FB02	2037046-03	09/03/2020		
2037046	WQ	0920FB03	2037046-04	09/04/2020		
2037046	WQ	0920FB04	2037046-05	09/05/2020		
2037046	WQ	0920FB05	2037046-06	09/06/2020		
2037046	WQ	0920FB06	2037046-07	09/07/2020		
2037046	WG	0920MW06GW	2037046-08	09/04/2020		Total
2037046	WG	0920MW06GW	2037046-09	09/04/2020		Dissolved
2037046	WG	0920MW100GW	2037046-10RE1	09/04/2020		Total
2037046	WG	0920MW100GW	2037046-11RE1	09/04/2020		Dissolved
2037046	WG	0920MW101GW	2037046-12RE1	09/05/2020	Lab QC	Total
2037046	WG	0920MW101GW	2037046-13	09/05/2020		Dissolved
2037046	WG	0920MW10GW	2037046-14	09/03/2020		Total
2037046	WG	0920MW10GW	2037046-15	09/03/2020		Dissolved
2037046	WG	0920MW16GW	2037046-16	09/03/2020		Total
2037046	WG	0920MW16GW	2037046-17	09/03/2020		Dissolved
2037046	WG	0920MW17GW	2037046-18	09/03/2020		Total
2037046	WG	0920MW17GW	2037046-19	09/03/2020		Dissolved
2037046	WG	0920MW27GW	2037046-20	09/04/2020		Total
2037046	WG	0920MW27GW	2037046-21	09/04/2020		Dissolved
2037046	WG	0920MW28GW	2037046-22	09/04/2020	MS/MSD	Total
2037046	WG	0920MW28GW	2037046-23	09/04/2020		Dissolved
2037046	WG	0920MW40GW	2037046-24	09/04/2020		Total
2037046	WG	0920MW40GW	2037046-25	09/04/2020		Dissolved
2037046	WG	0920MW42GW	2037046-26	09/07/2020		Total
2037046	WG	0920MW42GW	2037046-27	09/07/2020		Dissolved
2037046	WG	0920MW43GW	2037046-28	09/05/2020		Total

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Work Order	Matrix	Sample ID	Lab ID	Sample Date	QC	Comment
2037046	WG	0920MW43GW	2037046-29	09/05/2020		Dissolved
2037046	WG	0920MW44GW	2037046-30	09/06/2020		Total
2037046	WG	0920MW44GW	2037046-31	09/06/2020		Dissolved
2037046	WG	0920MW45GW	2037046-32	09/06/2020		Total
2037046	WG	0920MW45GW	2037046-33	09/06/2020		Dissolved
2037046	WG	0920MW46GW	2037046-34	09/06/2020		Total
2037046	WG	0920MW46GW	2037046-35	09/06/2020		Dissolved
2037046	WG	0920MW47GW	2037046-36	09/06/2020		Total
2037046	WG	0920MW47GW	2037046-37	09/06/2020		Dissolved
2037046	WG	0920MW48GW	2037046-38	09/03/2020	MS/MSD	Total
2037046	WG	0920MW48GW	2037046-39	09/03/2020		Dissolved
2037046	WG	0920MW50GW	2037046-40	09/06/2020		Total
2037046	WG	0920MW50GW	2037046-41	09/06/2020		Dissolved
2037046	WG	0920MW51GW	2037046-42	09/07/2020		Total
2037046	WG	0920MW51GW	2037046-43	09/07/2020		Dissolved
2037046	WG	0920MW52GW	2037046-44	09/06/2020		Total
2037046	WG	0920MW52GW	2037046-45	09/06/2020		Dissolved
2037046	WG	0920MW53GW	2037046-46	09/06/2020		Total
2037046	WG	0920MW53GW	2037046-47	09/06/2020		Dissolved
2037046	WG	0920MW54GW	2037046-48	09/07/2020		Total
2037046	WG	0920MW54GW	2037046-49	09/07/2020		Dissolved
2037046	WG	0920MW55GW	2037046-50	09/04/2020	Lab QC	Total
2037046	WG	0920MW55GW	2037046-51	09/04/2020		Dissolved
2037046	WG	0920MW56GW	2037046-52	09/06/2020		Total
2037046	WG	0920MW56GW	2037046-53	09/06/2020		Dissolved
2037046	WG	0920MW57GW	2037046-54	09/05/2020		Total
2037046	WG	0920MW57GW	2037046-55	09/05/2020		Dissolved
2037046	WG	0920MW58GW	2037046-56	09/07/2020		Total
2037046	WG	0920MW58GW	2037046-57	09/07/2020		Dissolved
2037046	WG	0920MW59GW	2037046-58	09/05/2020		Total
2037046	WG	0920MW59GW	2037046-59	09/05/2020		Dissolved
2037046	WG	0920MW99GW	2037046-60	09/03/2020		Total
2037046	WG	0920MW99GW	2037046-61	09/03/2020		Dissolved
2037046	SW	0920RD05SW	2037046-62	09/02/2020		Total
2037046	SW	0920RD05SW	2037046-63	09/02/2020		Dissolved
2037046	SW	0920RD06SW	2037046-64	09/02/2020		Total
2037046	SW	0920RD06SW	2037046-65	09/02/2020		Dissolved
2037046	SW	0920RD08SW	2037046-66	09/02/2020		Total
2037046	SW	0920RD08SW	2037046-67	09/02/2020		Dissolved
2037046	SW	0920RD10SW	2037046-68	09/02/2020		Total
2037046	SW	0920RD10SW	2037046-69	09/02/2020		Dissolved
2037046	SW	0920RD15SW	2037046-70	09/02/2020	MS/MSD	Total

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Work Order	Matrix	Sample ID	Lab ID	Sample Date	QC	Comment
2037046	SW	0920RD15SW	2037046-71	09/02/2020		Dissolved
2037046	SW	0920RD99SW	2037046-72RE1	09/02/2020		Total
2037046	SW	0920RD99SW	2037046-73	09/02/2020		Dissolved

SDG	Matrix	Test Method	Number of Samples	Sample Type
2037046	W	EPA 1631 – Low-Level Mercury	33	N/FD
2037046	W	EPA 1631 – Dissolved Low-Level Mercury	33	N/FD
2037046	W	EPA 1631 – Low-Level Mercury	6	FB
2037046	W	EPA 1631 – Low-Level Mercury	1	EB

General Sample Information	
Do Samples and Analyses on COC check against Lab Sample Tracking Form?	Yes.
Did coolers arrive at lab between 2 and 6°C and in good condition as indicated on COC and Cooler Receipt Form?	Thermal preservation of the samples is not required per the method.
Frequency of Field QC Samples Correct? Field Duplicate - 1/20 samples MS/MSD - 1/20 samples Equipment Blank - 1/ set of samples per day?	<ul style="list-style-type: none"> - Three field duplicates for total and dissolved portions were collected for 24 groundwater samples. - One field duplicate was collected for total and dissolved portions for 5 surface water samples. - Three MS/MSD was collected 33 aqueous samples. - One equipment blank was collected on dedicated field filters. - Six field blanks were collected in the field.
Case narrative present and complete?	Yes.
Any holding time violations?	No.

The following tables are presented at the end of this DUSR and provide summaries of results outside QC criteria:

- Method Blanks Results (Table 2, 2A, and 2B)
- MS/MSD Outside Limits (Table 3 and 3A)
- LCS Outside Limits (Table 4)
- Reanalysis Results (Table 5)
- Field Duplicate Results (Table 6)

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Mercury by EPA Method 1631	
Description	Notes and Qualifiers
Any compounds present in method, trip, or field blanks (see Table 2)?	Mercury was detected in field blanks 0920FB03 and 0920FB06.
For samples, if results are < 5 times the blank, then "U" flag data (see Tables 2A and 2B).	Dissolved portions of samples 0920MW06GW and 0920MW40GW were less than 5X the blank 0920FB03 detection. The samples should be considered estimated and were already J qualified due to being between the MDL and RL. No additional qualifications were made. Dissolved portion of sample 0920MW58GW was less than 5X the blank 0920FB06 detection. The sample result was J qualified as estimated.
Is Laboratory QC frequency at least one blank, standard reference material (SRM) and MS/MSD with each batch?	Yes.
Is MS/MSD within QC criteria (see Table 3 and 3A)? If out and LCS is compliant, then "J" flag positive data in original sample due to matrix.	Yes.
Is SRM within QC criteria (see Table 4)?	Yes.
Are the initial calibration standards recovered between 90-110%?	Yes.
Spot check ICV 85-115%.	The ICVs were acceptable.
Spot check CCV 77-123%.	The CCVs were acceptable.
Spot check ICB/CCB detections.	Yes. Mercury was detected in multiple CCBs below the MDL values. No qualifications were made.
Were any samples reanalyzed or diluted (see Table 5)? For any sample reanalysis or dilutions, is only one reportable result flagged?	Samples 0920MW100GW (2037046-10) and 0920MW100GW (2037046-11) yielded results above the high calibration standard. The laboratory re-analyzed in sequence 2001185 at a higher dilution and the results were reported from sequence. Sample 0920MW101GW was re-analyzed due to potential carryover from dissolved and total samples 0920MW100GW. The sample was re-analyzed in sequence 2001185 and the re-analysis confirmed the original result. The re-analysis was reported. Sample 0920RD99SW yielded results below the MRL. The sample was reanalyzed and reported detectable results in sequence 2001185 using larger aliquots. The re-analysis was reported. The dissolved result for sample 0920MW47GW was higher than the associated total result for sample. Bottles were visually inspected, and labels were checked. The samples were re-analyzed in sequence 2001185 and the results confirmed. The results from original analysis sequence 2001174 was reported.

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Mercury by EPA Method 1631	
Description	Notes and Qualifiers
	Multiple samples were diluted as noted in Table 5 and no justification was given by laboratory in the case narrative. Samples yielding results above the calibration standard is suspected.
Do field duplicate results show good precision for all compounds (see Table 6)?	Yes.

Summary of Potential Impacts on Data Usability
Concerns
<ul style="list-style-type: none"> Dissolved portion of sample 0920MW58GW was less than 5X the blank 0920FB06 detection. The sample result was J qualified as estimated.

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Table 2 – List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qualifier	Units	MDL	PQL
1631E	0920FB03	FB	Mercury	0.18	J	ng/L	0.13	0.40
1631E	0920FB06	FB	Mercury	0.14	J	ng/L	0.13	0.40

Table 2A – List of Samples Qualified for Method Blank Contamination

None

Table 2B – List of Samples Qualified for Field Blank Contamination

Method	Field Blank	Matrix	Analyte	Blank Result	Sample Result*	Lab Qualifier	PQL	Affected Samples	Sample Flag
1631E	0920FB03	FB	Mercury	0.18	1.76/0.29	J	0.42	0920MW06GW	J Flag
1631E	0920FB03	FB	Mercury	0.18	1290/485		10.2	0920MW100GW	None
1631E	0920FB03	FB	Mercury	0.18	651/503		10.2	0920MW27GW	None
1631E	0920FB03	FB	Mercury	0.18	1220/563		102/10.2	0920MW28GW	None
1631E	0920FB03	FB	Mercury	0.18	2.37/0.26	J	0.41	0920MW40GW	J Flag
1631E	0920FB03	FB	Mercury	0.18	38.1/25.7		10.5/0.42	0920MW55GW	None
1631E	0920FB06	FB	Mercury	0.14	63.4/32.1		2.04	0920MW42GW	None
1631E	0920FB06	FB	Mercury	0.14	7.74/1.12		0.41	0920MW51GW	None
1631E	0920FB06	FB	Mercury	0.14	3.50/ND		0.42	0920MW54GW	None
1631E	0920FB06	FB	Mercury	0.14	15.8/0.59		0.41/0.42	0920MW58GW	J Flag

*The results for total and dissolved mercury are provided under the “Sample Result” column.

Table 3 – List of MS/MSD Recoveries outside Control Limits

None

Table 3A – List of RPDs outside Control Limits

None

Table 4 – List of SRM Recoveries outside Control Limits

None

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Table 5 – Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
0920MW100GW	2037046-10RE1	1631E (Total)	N	26X: The original analysis yielded sample results that exceeded the highest calibration standard. The sample was re-analyzed at a dilution and the diluted sample results were reported.
0920MW100GW	2037046-11RE1	1631E (Dissolved)	N	26X: The original analysis yielded sample results that exceeded the highest calibration standard. The sample was re-analyzed at a dilution and the diluted sample results were reported.
0920MW101GW	2037046-12RE1	1631E (Total)	N	5X: Sample was re-analyzed due to potential carryover from dissolved and total samples 0920MW100GW. The re-analysis confirmed the initial results.
0920RD99SW	2037046-72RE1	1631E (Total)	N	The sample yielded a value below the reporting limits; therefore, the laboratory reanalyzed the sample and reported detectable results. The re-analysis was reported.
0920MW47GW	2037046-36	1631E (Total)	N	The dissolved result was higher than the associated total result for sample. The sample was re-analyzed, and the results confirmed. The results from original analysis was reported.
0920MW47GW	2037046-37	1631E (Dissolved)	N	The dissolved result was higher than the associated total result for sample. The sample was re-analyzed and the results confirmed. The results from original analysis was reported.
0920MW16GW	2037046-16	1631E (Total)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW16GW	2037046-17	1631E (Dissolved)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW27GW	2037046-20	1631E (Total)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW27GW	2037046-21	1631E (Dissolved)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW28GW	2037046-22	1631E (Total)	N	255X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW28GW	2037046-23	1631E (Dissolved)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW42GW	2037046-26	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW42GW	2037046-27	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW45GW	2037046-32	1631E (Total)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW45GW	2037046-33	1631E (Dissolved)	N	5X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW50GW	2037046-40	1631E (Total)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920MW55GW	2037046-50	1631E	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.

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Sample ID	Lab ID	Method	Sample Type	Action
		(Total)		
0920RD06SW	2037046-64	1631E (Total)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920RD08SW	2037046-66	1631E (Total)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.
0920RD15SW	2037046-70	1631E (Total)	N	26X: Sample was diluted by laboratory. No reasoning discussed in case narrative.

Table 6 – Summary of Field Duplicate Results

Method	Analyte	Unit	Matrix	PQL	Anal Type	0920MW48GW	0920MW99GW	RPD	RPD Rating	Sample Qual
EPA 1631	Mercury, Total	ng/l	WG	0.41	A	4.79	4.51	6.0%	Good	None
EPA 1631	Mercury, Dissolved	ng/l	WG	0.41	A	3.07	2.8	9.2%	Good	None

Method	Analyte	Unit	Matrix	PQL	Anal Type	0920MW57GW	0920MW101GW	RPD	RPD Rating	Sample Qual
EPA 1631	Mercury, Total	ng/l	WG	0.41	A	38.7	40.6	4.8%	Good	None
EPA 1631	Mercury, Dissolved	ng/l	WG	0.41	A	14.4	15.7	8.6%	Good	None

Method	Analyte	Unit	Matrix	PQL	Anal Type	0920MW28GW	0920MW100GW	RPD	RPD Rating	Sample Qual
EPA 1631	Mercury, Total	ng/l	WG	10.2	A	1220	1290	5.6%	Good	None
EPA 1631	Mercury, Dissolved	ng/l	WG	10.2	A	563	485	14.9%	Good	None

Method	Analyte	Unit	Matrix	PQL	Anal Type	0920RD10SW	0920RD99SW	RPD	RPD Rating	Sample Qual
EPA 1631	Mercury, Total	ng/l	SW	0.41	A	5.25	5.36	2.1%	Good	None
EPA 1631	Mercury, Dissolved	ng/l	SW	0.41	A	4.22	3.21	27.2%	Good	None

Acronym List and Table Key:

- CCB = continuing calibration blank
- CCV = continuing calibration verification

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Acronym List and Table Key:

COC	=	chain of custody
DUSR	=	data usability summary report
EB	=	equipment blank
FB	=	field blank
FD	=	field duplicate
ICB	=	initial calibration blank
ICV	=	initial calibration verification
LR	=	laboratory replicate
MB	=	method blank
MS	=	matrix spike
MSD	=	matrix spike duplicate
N	=	normal sample
ND	=	not detected
QA	=	quality assurance
QAPP	=	quality assurance project plan
QC	=	quality control
RB	=	rinsate blank
RPD	=	relative percent difference
SDG	=	sample delivery group